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JOURNAL

OF

ECONOMIC ENTOMOLOGY

Official Organ American Association of Economic Entomologists

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Geneva, N. Y.

Thirty-sixth Annual Meeting of the American Association of Economic Entomologists
Cincinnati, Ohio

December 29, 1923 to January 2, 1924

THIRTY-SIXTH ANNUAL MEETING OF THE AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS, CINCINNATI, OHIO,

DECEMBER 29, 1923 TO JANUARY 2, 1924

The 36th annual meeting of the American Association of Economic Entomologists will be held at Cincinnati, Ohio, December 29, 1923, to January 2, 1924.

The meeting of the Sections of Apiculture and Horticultural Inspection will be held on Saturday, December 29, prior to the opening session of the general association. The opening business session of the association will be held Monday morning, December 31, at which time the address of the President will be delivered. Meetings will continue on Tuesday and Wednesday.

Sectional Meetings

The meeting of the Section of Apiculture will be held at 10 a. m., Saturday, December 29, in Room 11, McMicken Hall.

The Section of Horticultural Inspection will meet at 1.30 p. m., Saturday, December 29, in Room 11, McMicken Hall.

Other Meetings

The annual meeting of the American Association for the Advancement of Science and many of its sections and affiliated societies will be held December 27, 1923, to January 2, 1924.

The Sigma Xi dinner will be held at 6.45 p. m., December 28.

A demonstration lecture on "The Vacuum; There's something in it" will be given by Dr. Willis Rodney Whitney at 8.45 p. m., December 28 in the Hughes High School Auditorium.

The Entomological Society of America will open its meeting on Thursday, December 27, and continue its sessions on Friday and Saturday.

Entomologists interested in the Insect Pest Survey and in extension work will meet at 8 p. m., Monday, December 31. Members of this association interested in medical entomology will meet in joint session with members of Section N. The exact place of meeting will be announced later.

The Committee on Policy will meet at 6.30 p. m., Saturday, December 29, at Hotel Gibson.

Hotel Headquarters

Hotel headquarters for this association will be at the Hotel Gibson where rates have been secured ranging from $2.50 to $8.00 for single rooms and $4.00 to $10.00 for double rooms. All rooms are provided with bath. Members are requested to engage rooms promptly.

Railroad Rates

Reduced rates will be secured from some of the railroads. Members should obtain exact information prior to the time of the meeting from their local railroad agent or from Dr. Burton E. Livingston, Permanent Secretary, American Association for the Advancement of Science, Smithsonian Institution, Washington, D. C.

Dinner

The entomologists dinner will be held on Tuesday evening, January 1, at 7 p. m.

Membership

Applications for membership can be secured from the Secretary or from the Committee on Membership. These should be filled out, properly endorsed, and filed with the Membership Committee on or before December 29. Every application must be accompanied with a fee of $3.50 to cover dues and subscription to the JOURNAL for the year following election.

Program

SECTION OF APICULTURE

S. B. FRACKER, *Chairman* G. M. BENTLEY, *Secretary*

Saturday morning session, December 29, 10 a. m., Room 11, McMicken Hall

Address of the Chairman, S. B. Fracker, Madison, Wisconsin.

READING OF PAPERS AND DISCUSSIONS

1. Methods of Teaching Beekeeping—Symposium.
   A. Content of the Elementary Course. (10 minutes). J. S. Hine, Columbus, Ohio.
   B. Laboratory Methods. (10 min.) G. M. Bentley, Knoxville, Tenn.

C. Methods of Handling a Winter Short Course. (10 min.) H. F. Wilson, Madison, Wis.

D. Research Problems Adapted for Graduate Students. (10 min.) F. B. Paddock, Ames, Iowa.

E. Other Preparation Needed by Those Majoring in Beekeeping. (10 min.) F. E. Millen, Guelph, Canada.

2. The Honey Bee as an Agent in the Pollination of Apples, Pears and Cranberries. (10 min.) Ray Hutson, New Brunswick, N. J.

3. Seasonal Variation in Brood Population. (10 min.) W. J. Nolan, Washington, D. C.

4. Notes on Fall Feeding. (15 min.) F. B. Paddock, Ames, Iowa.

5. The Relation of Stores to Brood Rearing. (10 min.) J. H. Merrill, Manhattan, Kan.

6. The Storing and Ripening of Honey by Honeybees. (10 min.) (Lantern.) Wallace Park, Urbana, Ill.

7. Temperature Changes in the Hive During a Honey-flow. (10 min.) J. I. Hambleton, Washington, D. C.

8. Spreading Foulbrood by Un-intelligent Treatment. (10 min.) E. R. Root, Medina, Ohio.

9. The Relation of Bacillus Alvei to Confusing Symptoms in European Foulbrood. (10 min.) A. P. Sturtevant, Washington, D. C.

10. The Status of Isle of Wight Disease in Various Countries. (10 min.) E. F. Phillips, Washington, D. C.

Report of Committees.

Selection of Officers.

Adjournment.

Program

SECTION OF HORTICULTURAL INSPECTION

P. A. GLENN, *Chairman* E. R. SASSCER, *Secretary.*

Saturday Afternoon session, December 29, 1.30 p. m.; Room 11, McMicken Hall

Address by the Chairman, P. A. Glenn, Urbana, Illinois.

READING OF PAPERS AND DISCUSSIONS

1. Motion Picture—"Halting Foreign Plant Foes."

2. Recent Work of the Federal Horticultural Board. C. L. Marlatt.

3. Horticultural Inspection Methods in California. Lee A. Strong.

4. The Fight Against the Gipsy Moth in New Jersey. T. J. Headlee, New Brunswick, N. J.

5. Status of Hydrocyanic Acid Gas Treatment of Nursery Stc J. J. Davis, LaFayette, Ind.

6. Important Foreign Insect Pests Collected on Imported Nu.. Stock in 1923. E. R. Sasscer.

7. American Plant Production under Quarantine 37. R. Kent Beattie, Washington, D. C.

Reports of Committees.

Selection of Officers.

Adjournment.

Program

AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLGGISTS

Monday morning, December 31, 10 a. m.; Chemistry Auditorium.

Report of the Secretary.

Report of Subscription Agent, by C. W. Collins, Melrose Highlands, Mass.

Report of the Executive Committee, by President A. G. Ruggles.

Report of the Delegate Appointed to Attend the International Conference of Phytopathology and Economic Entomology at Wageningen, Holland, by L. O. Howard, Washington, D. C.

Report of the Representative to the National Research Council, by George A. Dean, Manhattan, Kansas.

Report of the Committee on Policy, by P. J. Parrott, Geneva, N. Y.

Report of the Trustees of the Crop Protection Institute, by W. C. O'Kane, Durham, N. H.

Report of the Representatives on the Council of the Union of American Biological Societies, by A. L. Quaintance, Washington, D. C.

Report of the Committee on Nomenclature, by Edith M. Patch, Orono, Me.

Report of the Committee on Index to Economic Entomology, by E. P. Felt, Albany, N. Y.

Report of the Committee on United States National Museum, by J. J. Davis, Lafayette, Ind.

Report of the Committee on Amendments to the Constitution and By-Laws, by W. P. Flint, Urbana, Ill.

Appointment of Committees.

Miscellaneous Business.

Unfinished Business.

Annual Address of the President, A. G. Ruggles, St. Paul, Minnesota.

1. "Pioneering in Economic Entomology."

READING OF PAPERS

2. The Insects Infesting Animal Products in the United States. (10 min.) Perez Simmons, Silver Spring, Md.

3. Further Observations on Tabanidae (Horseflies) in Louisiana. (10 min.) T. H. Jones and W. G. Bradley, Baton Rouge, La.

Adjournment.

Program

Monday Afternoon Session, December 31, 1923, 1:30 p. m.; Chemistry Auditorium

Discussion of the Presidential Address.

READING OF PAPERS

4. The Occurrence of the European Tortricid, *Cacoecia rosana* L. in Canada. (10 min.) Arthur Gibson, Ottawa, Canada.

This European insect has of recent years developed into a pest of importance in several sections of Canada.

5. Factors Affecting Damage to Crops by Insects. (10 min.) (Lantern). R. L. Webster, Fargo, N. D.

A brief statement concerning limiting factors to crop production and their relation to insect injury, with particular reference to deficient rainfall.

6. Temperature as a Limiting Factor in the Life of Subcortical Insects. (15 min.) S. A. Graham, St. Paul, Minn.

7. The Australian Prickly-pear Problem. (15 min.) (Lantern.) J. C. Hamlin, Houston, Texas.

An attempt biologically to control the prickly-pear pest.

8. The Gipsy Moth Problem in New York State. (12 min.) (Lantern.) E. P. Felt, Albany, N. Y.

9. Recent European Investigations of the Parasites of the Gipsy Moth and the Brown-tail Moth. (15 min.) S. S. Crossman and R. T. Webber, Melrose Highlands, Mass.

An account of recent introductions into the United States of parasites of the Gipsy Moth and Brown-tail Moth.

10. The Importation of Parasites to control the Japanese Beetle (*Popillia japonica*). (10 min.) (Lantern). L. B. Smith, Riverton, N. J.

A general summary of the work accomplished and results secured during past season.

11. Selective Parasitism by *Tiphia* sp. (8 min.) H. A. Jaynes and T. R. Gardner, Riverton, N. J.

The result of three years study of the parasitism on *Ochrosidia* (*Cyclocephala*) *immaculata* and *Popillia japonica*, by certain species of Tiphia.

12. Notes on the Life History of a Beneficial Reduviid, *Sinea diadema* (Fabr.). (5 min.) (Lantern). P. A. Readio, Lawrence, Kan.

13. Natural Enemies of Beet Leafhopper (*Eutettix tenella* Baker). Henry H. P. Severin, Berkeley, Calif.

14. Dusting Investigations on Truck Crops in Maryland. (15 min.) (Lantern). E. N. Cory and S. F. Potts, College Park, Md.

A summary of two years work with nicotine dusts on the pea aphis with special reference to the effectiveness of commercial and home mixed dusts, rates per acre and comparison of costs. Summaries of results with other dust mixtures used against the pea aphis.

15. Some Chemicals Attractive to Adults of the Onion Maggot, *Hylemyia antiqua* Meig. and the Seed-Corn Maggot (*Hylemyia cilicrura* Rond.). (15 min.) (Lantern). Alvah Peterson, New Brunswick, N. J.

Several alcohols and other organic chemicals attract males and female flies.

16. Some new aspects of the Bichloride Treatment for Cabbage Maggot Control. (10 min.) Hugh Glasgow, Geneva, N. Y.

Observations on the influence of mercuric chloride on plant growth, and on the development of certain diseases affecting cabbage seedlings.

17. A Stilt-bug, *Jalysus spinosus* Say, Destructive to the Tomato. (10 min.) C. R. Phipps, Mountain Grove, Mo.

Description, injury, life-cycle and control.

Adjournment.

Monday Evening Session, December 31, 1923, 8:00 p. m.; Chemistry Auditorium

MEETING OF THE INSECT PEST SURVEY AND EXTENSION ENTOMOLOGISTS

Program

Tuesday Morning Session, January 1, 1924, 10:00 a. m.; Chemistry Auditorium

18. Methods of Estimating Insect Abundance and Damage. Symposium. (10 minutes each).

Statistical Work in Entomology. J. A. Hyslop, Washington, D. C.

The Use of Biometrical Methods in the Interpretation of Codling Moth Experiments. F. Z. Hartzell, Fredonia, N. Y.

Methods of Estimating Insect Abundance and Damage.

The Gipsy Moth. A. F. Burgess, Melrose Highlands, Mass.
The San Jose Scale. J. J. Davis, Lafayette, Ind.
The Boll Weevil. W. D. Hunter, Houston, Texas.
Grasshoppers. Stewart Lockwood, Billings, Mont.
The Hessian Fly. W. H. Larrimer, West Lafayette, Ind.

Value of Statistical Methods in Entomology. C. L. Marlatt, Washington, D. C.

READING OF PAPERS AND DISCUSSIONS

19. Recent Developments in Greenhouse Fumigation with Hydrocyanic Acid Gas. (10 min.) (Lantern). E. R. Sasscer and C. A. Weigel, Washington, D. C.

Device for dropping cyanid in jars simultaneously in commercial houses. Value of liquefied hyrdocyanic acid gas. Preliminary notes on calcium cyanid. Plant tolerance.

20. Lubricating Oil Emulsion as a Control for *Chrysomphalus aonidum* in Greenhouses. (10 min.) C. A. Weigel and Miss B. M. Broadbent, Washington, D. C.

Results of recent experiments in controlling *Chrysomphalus aonidum* on Kentia palms, Ficus, and other ornamental plants.

21. The Use of Lubricating Oil Emulsions on Greenhouse Scale Insects. (5 min.) C. C. Compton, Aurora, Ill.

22. Oil sprays for the Control of the Winter Eggs of *Paratetranychus pilosus*. (15 min.) (Lantern). C. C. Hamilton, College Park, Md.

23. Four Year Experiments on the Control of the Red Spider (*Paratetranychus pilosus*. (10 min.) S. W. Frost, Arendtsville, Pa.

Dormant and Summer applications with dusts and sprays for the control of Red Spider.

Adjournment.

Program

Tuesday Afternoon Session, January 1, 1924, 1:30 p. m.; Chemistry Auditorium

READING OF PAPERS

24. Control of the Root-Knot Nematode. (15 min.) J. P Gainesville, Fla.

25. The Use of Calcium Cyanide Against Fleas and Oti Insect Pests. (10 min.) K. C. Sullivan, Columbia, Mo.

A brief summary of experiments which have been conducted during the with calcium cyanide on the control of fleas and melon pests; also notes on its use for fumigating greenhouses and nursery stock.

26. Calcium Cyanide. (10 min.) William Moore, New York,

The manufacture, chemical composition and the reactions which makes this pound a promising insecticide.

27. Soil Insecticide Investigations at the Japanese Beetle Laboratory during 1923. (5 min.) B. R. Leach, W. E. Fleming and J. P. Johnson Riverton, N. J.

28. Insecticidal Properties of Some Sulfur Compounds. (10 min. Albert Hartzell and F. H. Lathrop, Geneva, N. Y.

The methods of preparation of a Carbon Disulfide Emulsion and its possibilities a a contact insecticide.

29. The Price of Insecticides. (10 min.) V. I. Safro, Clarksville Tenn.

Elementary economic factors almost universally lost sight of by entomologists i the search for cheaper insecticides.

30. The Japanese Beetle Status in 1923. (10 min.) L. B. Smith Riverton, N. J.

General summary of spread and results of investigations on the control of this insec in 1923.

31. Some Recent Developments in the Use of Paradichlorobenzene. (10 min.) S. C. Chandler, Carbondale, Ill.

32. Three Years of Paradichlorobenzene Experiments in the South. (10 min.) O. I. Snapp, Fort Valley, Ga.

33. Carbon disulphid for exterminating the Round-headed Apple-tree borer (*Saperda candida*). (10 min.) O. A. Johannsen, Ithaca, N. Y.

The proposed method requires less time than when using the knife; neither mutilates nor injures the tree, andwhen properly used, is 100% efficient.

34. Notes on the Occurrence of the Oriental Fruit Moth (*Laspeyresia molesta*) in Southeastern Pennsylvania in 1923. (3 min.) T. L. Guyton, Harrisburg, Pa.

The appearance of *Laspeyresia molesta* in alarming numbers occurred over the southeastern corner of Pennsylvania. No injury was noticed in this area in 1922.

pos[illegible] New Fruit Pest. (10 min.) (Lantern). W. P. Flint, Stati[illegible]

The [illegible]ast 3 seasons, apples and peaches in Illinois have been injured by a M[illegible] eviously of rare occurrence in the State and not known to feed upon Met[illegible] rief summary of the character of injury and feeding habits of this beetle.

[illegible]ontrol of Leaf Hoppers (*Empoa rosae* L.) in bearing orchards. .) (Lantern). S. W. Frost and E. M. Craighead, Arendtsville, Pa.

type of injury to apple by hoppers; control experiments in bearing orchards.

. Should the July Apple Spray as given in Ohio be timed for the cond Brood only of Codling Worms? (5 min.) (Lantern). H. A. Gossard, Wooster, Ohio.

Relation between the life history of codling worms and time of spraying graphically shown. The chart shows that in Ohio the July spray is given for the first brood as well as the second.

38. A Side Light on Spray Injury to Apple Fruits. (5 min.) (Lantern). P. J. Parrott, Geneva, N. Y.

During recent years there has been growing interest with respect to the effect of spray materials on the quality and size of apple yields. In this paper data are presented relative to the occurrence of "spray burn" following applications of various dust and spray mixtures.

39. Spreader Tests on Apples and Peaches: A Second Report. (8 min.) L. A. Stearns and W. S. Hough, Blacksburg, Va.

Title indicates contents of paper; report covering a second seasons' investigation of casein spreader in orchard practice.

40. The Estimation of Dosage for Contact Dusts. (10 min.) F. Z. Hartzell, Fredonia, N. Y.

41. Spraying Experiments for the Control of the San Jose and other Scales. (10 min.) J. J. Davis, Lafayette, Ind.

Summary of experiments for three years testing dry and liquid lime-sulphur, miscible oils and lubricating oil emulsion for the control of the San Jose, Cottony Maple and Oyster Shell Scales.

42. Further Studies in Prune Root Borer Control in Oregon. (10 min.) F. H. Lathrop and V. M. Trask, Highland, N. Y.

Results of naphthalene whitewash applications and of "P. D. B." treatments.

43 Control measures for the cornfield ant (*Lasius niger americanus*) in Strawberry Beds. A Preliminary Report. (5 min.) W. J. Baerg, Fayetteville, Ark.

The paper is a brief description of the injury caused by the cornfield ant to strawberry plants and a report of the results obtained from the use of various insecticides.

44. The Houghton Gooseberry Aphis, *Myzus houghtonensis* Troop, as a Pest in Ohio. (5 min.) (Lantern). D. M. DeLong and A. A. Mathewson, Columbus, Ohio.

Notes on the life history and economic importance.

Adjournment.

Tuesday Evening Session, January 1, 1924, 7 p. m.

Entomologists Dinner.

Program

Wednesday Morning Session, January 2, 1924, 10:00 a. m.; Chemistry Auditorium

READING OF PAPERS

45. Certain Dusts as Agents for the Protection of Stored Seeds from Insect Infestation. (15 min.) T. J. Headlee, New Brunswick, N. J.

46. Notes on the Use of Chlorine Gas as an Insecticide. (3 min.) T. L. Guyton, Harrisburg, Pa.

Chlorine Gas was used in an attempt to control *Sitotroga cerealella*. The gas was found to be an imperfect insecticide and to reduce the germination about three-fourths.

PAPERS ON EUROPEAN CORN BORER

47. Research Projects and a Synopsis of Results. (8 min.) D. J. Caffrey, Arlington, Mass.

48. Environmental Studies. (8 min.) K. W. Babcock, Arlington, Mass.

49. Parasite Introductions. (8 min.) D. W. Jones, Arlington, Mass.

50. European Corn Borer Investigations in Ohio. (8 min.) L. L. Huber, Wooster, Ohio.

51. European Corn Borer: Control Measures Recommended in the Province of Ontario. (8 min.) Lawson Caesar, Guelph, Ontario, Canada.

52. Plowing as a Factor in Control. (8 min.) H. G. Crawford, Ottawa, Canada.

53. The European Corn Borer: Clean-up Measures. (8 min.) (Lantern). T. H. Parks, Columbus, Ohio.

54. Quarantines in Canada. (8 min.) L. S. McLaine, Ottawa, Canada.

55. European Corn Borer Quarantine (8 min.) L. H. Worthley, Arlington, Mass.

Adjournment.

Program

Wednesday Afternoon Session, January 2, 1924, 1:30 p.m.; Chemistry Auditorium

READING OF PAPERS

56. An Asiatic Beetle in Connecticut. *Anomala orientalis* Waterhouse. (10 min.) W, E. Britton, New Haven, Conn.

Specimens of *Anomala* collected in a nursery in New Haven in 1920 and 1921 were identified in May 1922, as *Anomala orientalis*. In 1923, white grubs injured the roots of grass in lawns in the vicinity. Adults were reared and proved to be this species.

57. The biology of *Anomala kansana*. (15 min.) W. P. Hayes and J. W. McColloch, Manhattan, Kan.

The life history, length of stages and importance of this new species is discussed.

58. Grasshopper Baits: With Special Reference to Sodium Arsenite. (12 min.) C. L. Corkins, Laramie, Wyo.

This paper will be a brief of the results of three years experimentation in Colorado.

59. The Time of Planting Corn as a Factor in Corn Earworm Control (10 min.) J. W. McColloch Manhattan, Kan.

60. Importance of the Flax-seed count in determining the Hessian fly free date. (5 min.) C. J. Drake, F. A. Fenton and F. G. Butcher, Ames, Iowa.

61. *Caenurgia erechtea* Cram. (Noctuidae) as an Alfalfa Pest. (7 min.) (Lantern). R. C. Smith, Manhattan, Kan.

One of the lesser alfalfa pests but often abundant in Kansas. The paper is a summary of life history and field observations with description of stages and one plate.

62. New Developments in Alfalfa Weevil Activity and Control. (15 min.) Claude Wakeland, Prama, Idaho.

63. Controlling Chinch Bugs in Missouri with Calcium Cyanide. (15 min.) Leonard Haseman and S. W. Bromley, Columbia, Mo.

Short paper dealing with the methods of controlling chinch bugs with Calcium Cyanide in both an experimental and practical way. Calcium cyanide was successfully used on a rather large scale in Missouri during the past season and it is the intention of this paper to explain briefly its use and the results obtained.

Final Business

Report of Committee on Resolutions.

Report of Committee on Membership.

Reports of other committees.

Nomination of Journal officers by advisory committee.

Report of Committee on Nominations.

Election of Officers.

Miscellaneous business.

Fixing the time and place of next meeting.

Final adjournment.

A. G. Ruggles, *President*,
St. Paul, Minn.

A. F. Burgess, *Secretary*,
Melrose Highlands, Mass.

CONTENTS

[1]Withdrawn for publication elsewhere.

AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

(Organized 1889, Incorporated December 29, 1913)

OFFICERS, 1923

President
A. G. RUGGLES, St. Paul, Minnesota

First Vice-President
H. A. GOSSARD, Wooster, Ohio

Second Vice-President (Pacific Slope Branch)
H. J. QUAYLE, Riverside, California

Third Vice-President (Horticultural Inspection)
P. A. GLENN, Urbana, Illinois

Fourth Vice-President (Apiculture)
S. B. FRACKER, Madison, Wisconsin

Secretary
A. F. BURGESS, Melrose Highlands, Massachusetts. Term expires, 1923.

PACIFIC SLOPE BRANCH
Secretary
E. O. ESSIG, Berkeley, California

SECTION OF HORTICULTURAL INSPECTION
Secretary
E. R. SASSCER, Washington, District of Columbia

SECTION OF APICULTURE
Secretary
G. M. BENTLEY, Knoxville, Tennessee

STANDING COMMITTEES

Committee on Policy.
P. J. PARROTT, Chairman, Geneva, New York. Term expires 1926.
GEORGE A. DEAN, Manhattan, Kansas. Ex-officio.
A. G. RUGGLES, St. Paul, Minnesota. Ex-officio.
A. F. BURGESS, Melrose Highlands, Massachusetts. Ex-officio.
E. P. FELT, Albany, New York. Ex-officio.
J. M. SWAINE, Ottawa, Canada. Term expires 1927.
WILMON NEWELL, Gainesville, Florida. Term expires 1925.
W. C. O'KANE, Durham, New Hampshire. Term expires 1924.
E. D. BALL, Washington, District of Columbia. Term expires 1923.

Committee on Nomenclature.
*EDITH M. PATCH, Chairman, Orono, Maine.
Z. P. METCALF, West Raleigh, North Carolina.
ARTHUR GIBSON, Ottawa, Canada.
A. C. BAKER, Washington, District of Columbia.
J. A. HYSLOP, Washington, District of Columbia.
A. N. CAUDELL, Washington, District of Columbia.

Committee on Membership.
J. S. HOUSER, Chairman, Wooster, Ohio. Term expires 1923.
GEORGE G. AINSLIE, Knoxville, Tennessee. Term expires 1924.
W. E. BRITTON, New Haven, Connecticut. Term expires 1925.

Advisory Board, Journal of Economic Entomology.
E. F. PHILLIPS, Washington, District of Columbia. Term expires 1925.
G. F. FERRIS, Stanford University, California. Term expires 1925.
ARTHUR GIBSON, Ottawa, Canada. Term expires 1924.
R. A. COOLEY, Bozeman, Montana. Term expires 1924.
H. A. GOSSARD, Wooster, Ohio. Term expires 1923.
C. H. POPENOE, Washington, District of Columbia. Term expires 1923.

Committee on the U. S. National Museum.
J. J. DAVIS, Chairman, LaFayette, Indiana. Term expires 1923.
O. A. JOHANNSEN, Ithaca, New York. Term expires 1927.
E. P. FELT, Albany, New York. Term expires 1926.
HERBERT OSBORN, Columbus, Ohio. Term expires 1925.
W. J. HOLLAND, Pittsburgh, Pennsylvania. Term expires 1924.

Representative to National Research Council.
GEORGE A. DEAN, Manhattan, Kansas.

Councillors for the American Association for the Advancement of Science.
T. J. HEADLEE, New Brunswick, New Jersey.
L. O. HOWARD, Washington, District of Columbia.

Trustees for Crop Protection Institute.
P. J. PARROTT, Geneva, New York. Term expires 1925.
W. E. BRITTON, New Haven, Connecticut. Term expires 1924.
W. C. O'KANE, Durham, New Hampshire. Term expires 1923.

Representatives on Council of Union of American Biological Societies.
A. L. QUAINTANCE, Washington, District of Columbia.
WILLIAM MOORE, Riverton, New Jersey.

LIST OF MEETINGS AND PAST OFFICERS

First Annual Meeting, Washington, D. C., Nov. 12—14, 1889. President C. V Riley; Vice-President, S. A. Forbes; Second Vice-President, A. J. Cook; Secreta John B. Smith.

Second Annual Meeting, Champaign, Ill., Nov. 11—13, 1890. (The same officers had charge of this meeting).

Third Annual Meeting, Washington, D. C., Aug. 15—18, 1891. President, James Fletcher; First Vice-President, F. H. Snow; Second Vice-President, Herbert Osborn; Secretary, L. O. Howard.

Fourth Annual Meeting, Rochester, N. Y., Aug. 15—16, 1892. President, J. A. Lintner; First Vice-President, S. A. Forbes; Second Vice-President, J. H. Comstock; Secretary, F. M. Webster.

Fifth Annual Meeting, Madison, Wis., Aug. 14—16, 1893. President, S. A. Forbes; First Vice-President, C. J. S. Bethune; Second Vice-President, John B. Smith; Secretary, H. Garman.

Sixth Annual Meeting, Brooklyn, N. Y., Aug. 14—15, 1894. President, L. O. Howard; First Vice-President, John B. Smith; Second Vice-President, F. L. Harvey; Secretary, C. P. Gillette.

Seventh Annual Meeting, Springfield, Mass., Aug. 27—28, 1895. President, John B. Smith; First Vice-President, C. H. Fernald; Secretary, C. L. Marlatt.

Eighth Annual Meeting, Buffalo, N. Y., Aug. 21—22, 1896. President, C. H. Fernald; First Vice-President, F. M. Webster; Second Vice-President, Herbert Osborn; Secretary, C. L. Marlatt.

Ninth Annual Meeting, Detroit, Mich., Aug. 12—13, 1897. President, F. M. Webster; First Vice-President, Herbert Osborn; Second Vice-President, Lawrence Bruner; Secretary, C. L. Marlatt.

Tenth Annual Meeting, Boston, Mass., Aug. 19—20, 1898. President Herbert Osborn; First Vice-President, Lawrence Bruner; Second Vice-President, C. P. Gillette; Secretary, C. L. Marlatt.

Eleventh Annual Meeting, Columbus, Ohio, Aug. 18—19, 1899. President, C. L. Marlatt; First Vice-President, Lawrence Bruner; Second Vice-President, C. P. Gillette; Secretary, A. H. Kirkland.

Twelfth Annual Meeting, New York, N. Y., June 22—23, 1900. President, Lawrence Bruner; First Vice-President, C. P. Gillette; Second Vice-President, E. H. Forbush; Secretary, A. H. Kirkland.

Thirteenth Annual Meeting, Denver, Colo., Aug. 23—24, 1901. President, C. P. Gillette; First Vice-President, A. D. Hopkins; Second Vice-President, E. P. Felt; Secretary, A. L. Quaintance.

Fourteenth Annual Meeting, Pittsburgh, Pa., June 27—28, 1902. President, A. D. Hopkins; First Vice-President, E. P. Felt; Second Vice-President, T. D. A. Cockerell; Secretary, A. L. Quaintance.

Fifteenth Annual Meeting, Washington, D. C., Dec. 26—27, 1902. President, E. P. Felt; First Vice-President, W. H. Ashmead; Second Vice-President, Lawrence Bruner; Secretary, A. L. Quaintance.

Sixteenth Annual Meeting, St. Louis, Mo., Dec. 29—31, 1903. President, M. V. Slingerland; First Vice-President, C. M. Weed; Second Vice-President, Henry Skinner; Secretary, A. F. Burgess.

Seventeenth Annual Meeting Philadelphia, Pa., Dec. 29—30, 1904. President, A. L. Quaintance; First Vice-President, A. F. Burgess; Second Vice-President, [redacted]ary E. Murtfeldt; Secretary, H. E. Summers.

Eighteenth Annual Meeting, New Orleans, La., Jan. 1—4, 1906. President, H.

Garman; First Vice-President, E. D. Sanderson; Second Vice-President, F. L. Washburn; Secretary, H. E. Summers.

Nineteenth Annual Meeting, New York, N. Y., Dec. 28—29, 1906. President, A. H. Kirkland; First Vice-President, W. E. Britton; Second Vice-President, H. A. Morgan; Secretary, A. F. Burgess.

Twentieth Annual Meeting, Chicago, Ill., Dec. 27—28, 1907. President, H. A. Morgan; First Vice-President, H. E. Summers; Second Vice-President, W. D. Hunter; Secretary, A. F. Burgess.

Twenty-first Annual Meeting, Baltimore, Md., Dec. 28—29, 1908. President, S. A. Forbes; First Vice-President, W. E. Britton; Second Vice-President, E. D. Ball; Secretary, A. F. Burgess.

Twenty-second Annual Meeting, Boston, Mass., Dec. 28—29, 1909. President, W. E. Britton; First Vice-President, E. D. Ball; Second Vice-President, H. E. Summers; Secretary, A. F. Burgess.

Twenty-third Annual Meeting, Minneapolis, Minn., Dec. 28—29, 1910. President, E. D. Sanderson; First Vice-President, H. T. Fernald; Second Vice-President, P. J. Parrott; Secretary, A. F. Burgess.

Twenty-fourth Annual Meeting, Washington, D. C., Dec. 27—29, 1911. President, F. L. Washburn; First Vice-President, E. D. Ball; Second Vice-President, R. H. Pettit; Secretary, A. F. Burgess.

Twenty-fifth Annual Meeting, Cleveland, Ohio, Jan. 1—3, 1913. President, W. D. Hunter; First Vice-President, T. J. Headlee; Second Vice-President, R. A. Cooley; Secretary, A. F. Burgess.

Twenty-sixth Annual Meeting, Atlanta, Ga., Dec. 31, 1913—Jan. 2, 1914. President, P. J. Parrott; First Vice-President, E. L. Worsham; Second Vice-President, Wilmon Newell; Secretary, A. F. Burgess.

Twenty-seventh Annual Meeting, Philadelphia, Pa., Dec. 28—31, 1914. President, H. T. Fernald; First Vice-President, Glenn W. Herrick; Second Vice-President, W. E. Britton; Third Vice-President, Wilmon Newell; Secretary, A. F. Burgess.

Special Meeting, Berkeley, Cal., Aug. 9—10, 1915. (Officers same as for Twenty-eighth Annual Meeting).

Twenty-eighth Annual Meeting, Columbus, Ohio, Dec. 27—30, 1915. President, Glenn W. Herrick; First Vice-President, R. A. Cooley; Second Vice-President W. E. Rumsey; Third Vice-President, E. F. Phillips; Secretary, A. F. Burgess.

Twenty-ninth Annual Meeting, New York, N. Y., Dec. 28—30, 1916. President, C. Gordon Hewitt; First Vice-President, G. A. Dean; Second Vice-President, E. D. Ball; Third Vice-President, W. J. Schoene; Fourth Vice-President, T. J. Headlee; Secretary, A. F. Burgess.

Thirtieth Annual Meeting, Pittsburgh, Pa., Dec. 31, 1917—Jan. 2, 1918. President, R. A. Cooley; First Vice-President, W. E. Hinds; Second Vice-President, A. W. Morrill; Third Vice-President, G. M. Bentley; Fourth Vice-President, B. N. Gates; Secretary, A. F. Burgess.

Thirty-first Annual Meeting, Baltimore, Md., Dec. 26—27, 1918. President, E. D. Ball; First Vice-President, W. C. O'Kane; Second Vice-President, G. P. Weldon; Third Vice-President, E. C. Cotton; Fourth Vice-President, Franklin Sherman, Jr.; Secretary, A. F. Burgess.

Thirty-second Annual Meeting, St. Louis, Mo., Dec. 31, 1919—Jan. 2, 1920. President, W. C. O'Kane; First Vice-President, A. G. Ruggles; Second Vice-President,

H. J. Quayle; Third Vice-President, E. C. Cotton; Fourth Vice-President, W. E. Britton; Secretary, A. F. Burgess.

Thirty-third Annual Meeting, Chicago, Ill., Dec. 29—31, 1920. President, Wilmon Newell; First Vice-President, H. A. Gossard; Second Vice-President, E. M. Ehrhorn; Third Vice-President, J. G. Sanders; Fourth Vice-President, F. B. Paddock; Secretary, A. F. Burgesss.

Thirty-fourth Annual Meeting, Toronto, Canada, Dec. 29—31, 1921. President, George A. Dean; First Vice-President, Arthur Gibson; Second Vice-President, E. O. Essig; Third Vice-President, A. G. Ruggles; Fourth Vice-President, H. F. Wilson; Secretary, A. F. Burgess.

Thirty-fifth Annual Meeting, Boston, Mass. Dec. 28—30, 1922. President, J. G. Sanders; First Vice-President, J. M. Swaine; Second Vice-President, A. L. Lovett; Third Vice-President, R. W. Harned; Fourth Vice-President, M. C. Tanquary; Secretary, A. F. Burgess.

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Porter, Carlos E., Casilla 2352, Santiago, Chili.
Pospiclow, Dr. Waldemar, Bureau of Entomology, Morskaya 44, Petrograd, Russia.
Reed, Charles S., Mendoza, Argentine Republic, South America.
Ritzema Bos, Dr. J., Wageningen, Holland.
Rosenfeld, A. H., Ingenio Santa Ana, F. C. N. O. A., Tucuman, Argentina.
Sajo, Prof, Karl, Godollo-Veresegyhaz, Hungary.
Schoyen, Prof. W. M., Zoological Museum, Christiania, Norway.
Severin, Prof. G., Curator Natural History Museum, Brussels, Belgium.
Shipley, Prof. Arthur E, Christ's College, Cambridge, England.
Silvestri, Dr. F. R., Scuola Superiore di Agricoltura, Portici, Italy.
Theobald, Frederick V., Wye Court, Wye, Kent, England.
Thompson, Rev. Edward H., Franklin, Tasmania.
Tillyard, R. J., Cawthron Institute of Scientific Research, Nelson, New Zealand.
Tryon, H., Queensland Museum, Brisbane, Queensland, Australia.
Urich, F. W., Department of Agriculture, Port of Spain, Trinidad, West Indies.
Vermorel, V., Station Viticole, Villefranche, Rhone, France.

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Proceedings of the Thirty-Fifth Annual Meeting of the American Association of Economic Entomologists

The thirty-fifth annual meeting of the American Association of Economic Entomologists was held at the Massachusetts Institute of Technology, Cambridge, Mass., December 28 to 30, 1922.

The meeting convened at 10.30 A. M., December 28, and was called to order by President James G. Sanders.

The annual reports were read and routine business transacted. The address of the President was given at the afternoon session and this was followed by a program of papers. On that evening, the Section of Apiculture held its annual meeting in the auditorium of the Boston Society of Natural History.

Friday morning, December 29, a meeting was held of the Section of Horticultural Inspection. In the afternoon, a series of papers were read before the association, but this was preceded by a symposium on "Standards for the Training of Men who are to enter Professional Entomology." The entomologists dinner was held in the evening at Ford Hall, Boston. About 140 entomologists were present.

On Saturday morning, December 30, a joint meeting was held at the Massachusetts Institute of Technology with the American Phytopathological Society, the subject being "Plant Quarantines." The final session was held that afternoon.

Prior to the opening of the meeting of the Association, a joint meeting was held of the entomologists interested in extension work and in the Insect Pest Survey. A meeting was also held during the week of scientists interested in transmission of disease by insects to man. A number of members of the association attended this meeting.

The business proceedings form Part I of this report, and the addresses, papers, and discussions, Part II.

The proceedings of the Sections of Apiculture and Horticultural Inspection are also included.

Papers read at the joint meeting with the Phytopathological Society have been summarized and will be published in the JOURNAL OF ECONOMIC ENTOMOLOGY.

PART I. BUSINESS PROCEEDINGS

The meeting was called to order by President Sanders at 10.30 A. M., Thursday, December 28, 1922. Over 200 members and visitors attended the session. The following members were present.

Aldrich, J. M., Washington, D. C.
Alexander, C. P., Amherst, Mass.
Allen, R. H., Boston, Mass.
Arnold, George G., Agricultural College, Miss.
Back, E. A., Washington, D. C.
Baker, A. C., Washington, D. C.
Bailey, H. L, Bradford, Vt.
Bailey, I. L., Northboro, Mass.
Balduf, W. V., Columbus, Ohio.
Ball, E. D., Washington, D. C.
Barber, G. W., Arlington, Mass.
Barnes, D. F., Melrose Highlands, Mass.
Barnes, P. T., Harrisburg, Pa.
Bartley, H. W., Silver Creek, N. Y.
Batchelder, C. H., Orono, Me.
Bentley, G. M., Knoxville, Tenn.
Beyer, A. H., Gainesville, Florida.
Blackman, M. W., Syracuse, N. Y.
Blake, D. H., Washington, D. C.
Babcock, K. W., Arlington, Mass.
Borodin, D. N., New York, N. Y.
Bourne, A. I., Amherst, Mass.
Brittain, W. H., Truro, N. S.
Britton, W. E., New Haven, Conn.
Brues, C. T., Boston, Mass.
Burgess, A. F., Melrose Highlands, Mass.
Caffrey, D. J., Arlington, Mass.
Cartwright, William B., Centralia, Ill.
Chapman, J. W., Dumagueta, P. I.
Chapman, R. N., Minneapolis, Minn.
Claasson, P. W., Ithaca, N. Y.
Collins, C. W., Melrose Highlands, Mass.
Compton, C. S., Urbana, Ill.
Cook, Mel. T., New Brunswick, N. J.
Cooley, R. A., Bozeman, Mont.
Cory, E. N., College Park, Md.
Craighead, F. C., Ottawa, Canada.
Crampton, G. C., Amherst, Mass.
Crosby, C. R., Ithaca, N. Y.
Crossman, S. S., Melrose Highlands, Mass.
Dean, George A., Manhattan, Kansas.
De Long, Dwight M., Columbus, Ohio.
Dohanian, S. M., Melrose Highlands, Mass.
Doucette, C. F., Doylestown, Pa.
Ellington, G. W., Washington, D. C.
Ellis, R. C., Arlington, Mass.
Ellis, W. O., Arlington, Mass.
Fackler, H. L., Knoxville, Tenn.
Felt, E. P., Albany, N. Y.
Fernald, H. T., Amherst, Mass.
Fink, D. E., Riverton, N. J.
Flint, W. P., Urbana, Ill.
Fracker, S. B., Madison, Wis.
Frost, H. L., Arlington, Mass.
Frost, S. W., Arendtsville, Pa.
Garman, Philip, New Haven, Conn.
Gibson, Arthur, Ottawa, Canada.
Glasgow, Hugh, Geneva, N. Y.
Glenn, P. A., Urbana, Ill.
Graf, J. E., Biloxi, Miss.
Graves, F. W., Jr., Melrose Highlands, Mass.
Griswold, Grace Hall, Ithaca, N. Y.
Guyton, T. L., Harrisburg, Pa.
Hartley, E. A., Syracuse, N. Y.
Haseman, Leonard, Columbia, Mo.
Headlee, T. J., New Brunswick, N. J.

Hine, J. S., Columbus, Ohio.
Hodgson, B. E., Arlington, Mass.
Hofer, C. E., Silver Creek, N. Y.
Hoffman, William E., St. Paul, Minn.
Hood, C. E., Melrose Highlands, Mass.
Hooker, W. A., Washington, D. C.
Horsfall, J. L., Bustleton, Pa.
Horton, J. R., Wichita, Kan.
Houser, J. S., Wooster, Ohio.
Howard, L. O., Washington, D. C.
Hyslop, J. A., Washington, D. C.

Jaynes, H. A., Riverton, N. J.
Johannsen, O. A., Ithaca, N. Y.
Jones, D. W., Melrose Highlands, Mass.

Kellogg, V. L., Washington, D. C.
Kennedy, C. H., Columbus, Ohio.
Lamson, G. H., Jr., Storrs, Conn.
Larrimer, W. H., West LaFayette, Ind.
Larson, A. O., Alhambra, Calif.
Lathrop, F. H., Corvallis, Ore.
Leihy, R. W., Raleigh, N. C.
Leonard, M. D., New York, N. Y.
Lowry, Philip R., Durham, N. H.
Lowry, Q. S., Canton, Mass.

MacLeod, G. F., Geneva, N. Y.
Manter, J. A., Storrs, Conn.
Marcovitch, S., Knoxville, Tenn.
Marlatt, C. L., Washington, D. C.
Martin, J. F., Washington, D. C.
McIntyre, H. L., Melrose Highlands, Mass.
McLaine, L. S., Ottawa, Canada.
Merrill, G. B., Gainesville, Florida.
Metcalf, C. L., Urbana, Ill.
Metcalf, Z. P., West Raleigh, N. C.
Minott, C. W., Melrose Highlands, Mass.
Mitchell, T. B., Raleigh, N. C.
Moore, William, Riverton, N. J.
Morse, A. P., Wellesley, Mass.
Mosher, F. H., Melrose Highlands, Mass.
Muesebeck, C. F. W., Melrose Highlands, Mass.

Newell, Wilmon, Gainesville, Florida.
Nolan, Willis J., Washington, D. C.

O'Kane, W. C., Durham, N. H.
Osborn, Herbert, Columbus, Ohio.
Osgood, W. A., Durham, N. H.

Packard, C. M., Sacramento, Calif.
Palmer, J. B., Ithaca, N. Y.
Parrott, P. J., Geneva, N. Y.
Patch, Edith M., Orono, Me.
Patch, L. H., Arlington, Mass.
Peirson, H. B., Augusta, Me.
Peterson, Alvah, New Brunswick, N. J.
Phillips, E. F., Washington, D. C.
Phillips, Saul, Saugus, Mass.
Phipps, Clarence R., Mountain Grove, Mo.
Popenoe, C. H., Washington, D. C.
Porter, B. A., Washington, D. C.

Reed, W. V., Atlanta, Ga.
Regan, W. S., Bozeman, Mont.
Robinson, J. M., Auburn, Ala.
Rogers, D. M., Boston, Mass.
Rohwer, S. A., Washington, D. C.
Rosewall, O. W., Baton Rouge, La.
Ruggles, A. G., St. Paul, Minn.

Sanders, G. E., Annapolis Royal, N. S.
Sanders, J. G., Harrisburg, Pa.
Sasscer, E. R., Washington, D. C.
Satterthwait, A. F., Webster Groves, Mo.
Schaffner, J. V., Jr., Melrose Highlands, Mass.
Schoene, W. J., Blacksburg, Va.
Shelford, V. E., Urbana, Ill.
Skinner, Henry, Philadelphia, Pa.
Smith, G. A., Boston, Mass.
Smith, M. R., Agricultural College, Miss.
Smith, R. H., San Francisco, Calif.
Smith, R. I., Boston, Mass.
Smulyan, M.T., Melrose Highlands, Mass.
Smyth, E. G., Washington, D. C.
Snapp, O. I., Fort Valley, Ga.
Snyder, T. E., Washington, D. C.
Spencer, G. J., Guelph, Canada.
Stearns, L. A., Leesburg, Va.
Summers, J. N., Melrose Highlands, Mass.
Sutton, F. J., Middleport, N. Y.
Swaine, J. M., Ottawa, Canada.

Tanquary, M. C., College Station, Texas.
Thomas, F. L., Auburn, Ala.
Tothill, J. D., Fredericton, N. B., Canada.
Treherne, R. C., Ottawa, Canada.

Vance, A. McC., Charlottesville, Va.
Van Dine, D. L., State College, Pa.
Vickery, R. A., Cambridge, Mass.

Wade, J. S., Washington, D. C.

Walton, W. R., Washington, D. C.
Webber, R. T., Melrose Highlands, Mass.
Weed, C. M., Lowell, Mass.
Weigel, C. A., Washington, D. C.
Wheeler, W. M., Forest Hills, Mass.
Whitmarsh, R. D., Milwaukee, Wis.
Winchester, H.I., Melrose Highlands, Mass.
Woods, W. C., Middletown, Conn.
Wooldridge, Reginald, Melrose Highlands, Mass.
Worthley, H. N., Amherst, Mass.
Worthley, L. H., Arlington, Mass.

PRESIDENT J. G. SANDERS: It is my privilege to call to order the thirty-fifth annual meeting of the American Association of Economic Entomologists.

We will first hear the report of the Secretary.

REPORT OF THE SECRETARY

At the time of the Toronto meeting, the total membership of the association was 652, divided into the following classes: active, 282; associate, 322; foreign, 48. At that meeting, 36 associate members were elected and 19 were transferred to the active roll and one active and 7 associate members resigned. Since that time, 1 active member has died, 13 associate members have been dropped for non-payment of dues and 10 associate members that were elected at the Chicago meeting have been dropped on account of having paid no dues.

The present membership is 299 active, 310 associate and 48 foreign, making a total of 657, and a net gain of 5.

On December 10, 1921, Mr. Elbert S. Tucker, an active member located at Tallulah, La., passed away. He had been in poor health for some time. His scientific training was received at the University of Kansas, and he had been employed by the University of Kansas, Texas Agricultural Experiment Station, Louisiana Experiment Station and U. S. Bureau of Entomology. He was a faithful worker, and is greatly missed by those who knew him.

The Pacific Slope Branch held its annual meeting at the University of Utah, Salt Lake City, Utah, July 22d, in connection with the annual summer meeting of the Pacific Slope Division of the American Association for the Advancement of Science. An excellent program was presented, which was published in the December number of the JOURNAL OF ECONOMIC ENTOMOLOGY.

Certificates for the past presidents of the association were prepared and presented at the annual dinner at the Toronto meeting.

JOURNAL OF ECONOMIC ENTOMOLOGY

During the past year the price of printing the JOURNAL has been slightly reduced, and owing to better facilities in the printing plant of our publishers, the issues have been mailed more promptly than heretofore.

As the result of the appointment of a Circulation Agent, which was authorized at the last annual meeting, it has been possible to materially increase the subscription list. Mr. C. W. Collins, who has taken over this work, has succeeded in interesting members in some of the states who have succeeded in securing many new subscribers. This work should be extended so that there will be in every state at least one member of the association actively seeking new subscribers. By following

this method continuously, it should be possible to greatly increase the circulation of the JOURNAL which in turn will make possible the publication of a greater number of papers.

At the close of the last year, the subscription list numbered 896. It now numbers 998. Earnest co-operation with Mr. Collins is requested and there is no good reason why this should not result in a very large increase in our subscription list.

For the first time in several years, it is now possible to announce that the funds loaned by the association to finance the JOURNAL have been repaid, and the publication is now on a self-supporting basis. The prospects are excellent for maintaining this status, and it should be a satisfaction for members of the association to know that the JOURNAL has passed through a difficult financial period without being obliged to materially curtail the number of pages published or be under obligation to the association or its members for any funds that were advanced during the past.

The supply of back numbers of the JOURNAL has been reduced by sales so that it will be advisable to increase the price of some of these volumes in the near future. All volumes except Volume I are now selling at $3.50 each. It is suggested that members desiring to complete their file do so without delay and take advantage of this opportunity before the price is increased.

INDEX TO THE LITERATURE OF AMERICAN ECONOMIC ENTOMOLOGY, I

During the past year, a number of copies of this Index have been sold. As a result of this income, it has been possible to bind and place in cartons the 400 unbound copies of this publication. After defraying this expense there remains in the treasury approximately the same amount as was carried to the credit of that fund last year.

INDEX TO THE LITERATURE OF AMERICAN ECONOMIC ENTOMOLOGY, II

A limited number of copies of this publication have been sold during the past year and the funds secured have been used in supplying cartons for 500 volumes and in paying outstanding loans. It has been possible to pay the last four notes of $25 each covering funds advanced by members to finance this publication and to return $225 to the association treasury in part payment of what was loaned on this account.

Index II now shows a deficit of $425. If sales during the next two years can be maintained in the same volume as during the last year, this amount can be liquidated.

PERMANENT FUND

At the Toronto meeting, the association voted, on recommendation of the executive committee, to establish a permanent fund, to which could be transferred each year a portion of the unexpended balance not required for current expenses. Before the adjournment of that meeting, the executive committee voted to transfer one—$100 Liberty Bond, which has been held by the association for several years, and $500 from the association treasury to this fund. It was understood that the Secretary should secure for the association a $500 Liberty Bond at the market price. This was done and the balance of the $500 deposited in the permanent fund. Since that time, by vote of the executive committee, $179.83 which has been carried for a number of

years in the Melrose Savings Bank, was transferred to the permanent fund, and recently $500 not needed for current expenses, has been similarly transferred. The total amount in this fund on the date of closing the books, was $1334.75.

Association Statement

Balance in Treasury, December 2, 1921		$1053.80
Amount received from dues, 1921		773.00
Amount received from Malden National Bank, Interset		14.31
Amount received from loans		475.00
Paid—Stenographic report, 1921 meeting	$164.96	
Postage	57.80	
Programs and notices	78.23	
Diplomas	46.00	
Supplies and stationery	55.34	
Telegraph and expenses	10.22	
Returned checks	3.59	
Expenses—Pacific Slope Branch	11.18	
Funds transferred	1179.83	
Clerical work, Secretary's office	45.00	
One-half salary Secretary	50.00	
Balance, December 2, 1922	614.05	
Grand Total	$2316.11	$2316.11

Balance, Deposited in First National Bank, Malden, Mass.

Journal Statement

Balance in Treasury, December 2, 1921		$1324.03
Amount received from subscriptions, advertising, etc.		3620.36
Amount received from Malden National Bank, Interest		20.00
Paid, Postage	$91.30	
Printing	3404.44	
Notices	16.00	
Supplies and stationery	13.06	
Half-tones	165.15	
Telegraph and express	7.78	
Returned subscriptions	8.00	
Returned checks	8.25	
Loan paid	250.00	
Clerical Work, Editor's Office	75.00	
Salary, Editor	100.00	
Clerical work, Secretary's office	45.00	
One-half Salary of Secretary	50.00	
Balance, December 2, 1922	730.41	
Grand Total	$4964.39	$4964.39

Deposited in First National Bank, Malden, Mass.

INDEX I STATEMENT

Balance in Treasury, December 2, 1921		$146.69
Received from sales		175.15
Paid for postage	$5.70	
Paid for binding	133.91	
Paid for supplies and stationery	21.29	
Balance	160.94	
Grand Total	$321.84	$321.84

Balance Deposited in First National Bank, Malden, Mass.

INDEX II STATEMENT

Balance in Treasury, December 2, 1921		$28.83
Received from sales		329.16
Paid for postage	$5.87	
Supplies and stationery	25.85	
Paid for loans	325.00	
Balance	1.27	
Grand Total	$357.99	$357.99

Balance deposited in First National Bank, Malden, Mass.

PERMANENT FUND

1—4¼ Liberty Bond	$100.00
1—4¼ Liberty Bond	500.00
Transfer from association fund	179.83
Transfer from association fund	12.55
Transfer from association fund	500.00
Interest on bonds	25.50
Interest on deposit	16.87
Grand Total	$1334.75

4¼% Liberty Bonds—$600
Deposited in Melrose Savings Bank—$734.75

SUMMARY

Balance in Index I account	$160.94
Balance in Index II account	1.27
Balance in JOURNAL account	730.41
Balance in association account	614.05
Grand Total	$1506.67

Deposited in First National Bank, Malden, Mass.

Respectfully Submitted,
A. F. BURGESS, *Secretary*

Voted that the report be accepted.

PRESIDENT J. G. SANDERS: We will now hear a brief report by Mr. C. W. Collins, Circulation Agent of the JOURNAL OF ECONOMIC ENTOMOLOGY.

REPORT OF CIRCULATION AGENT

At the Toronto meeting of this Association in 1921, it was voted that the Editorial Board be granted permission to designate a circulation agent of the JOURNAL. The writer was accordingly asked to take up these duties in January and with the counsel of your Secretary has since been working to interest new subscribers. In starting out I requested 59 working entomologists residing in most of the States and in the Provinces of Canada to assist in the work by acting as leaders in their respective territories. Copies of printed circulars describing the scope and usefulness of the JOURNAL to which a subscription order blank was attached have also been supplied to the leaders. This cooperation has been successful in a measure with the result that some leaders have given freely of their time and energies toward directing subscriptions to the circulation Agent. About 1050 letters, mostly circular, have been written and sent in the interest of new subscriptions during the year.

The following table shows the total domestic and foreign subscribers in 1913, 1921 and increase in 1922, by states:

	1913	*1921*	*1922*		*1913*	*1921*	*1922*
Alabama	3	7	12	Nebraska	3	4	2
Arizona	7	5	6	Nevada	1	2	2
Arkansas	2	5	6	New Hampshire	4	7	7
California	34	65	63	New Jersey	14	22	23
Colorado	7	15	14	New Mexico	3	4	3
Connecticut	10	15	20	New York	52	40	61
Delaware	3	2	3	North Carolina	6	10	9
Dist. of Columbia	50	42	53	North Dakota	0	2	1
Florida	7	17	20	Ohio	22	32	33
Georgia	6	9	9	Oklahoma	2	4	4
Idaho	2	6	4	Oregon	10	12	11
Illinois	30	25	28	Pennsylvania	18	33	39
Indiana	16	13	13	Rhode Island	3	1	2
Iowa	5	14	12	South Carolina	4	3	1
Kansas	16	16	17	South Dakota	1	2	2
Kentucky	4	4	6	Tennessee	6	10	11
Louisiana	12	15	13	Texas	16	24	25
Maine	5	6	5	Utah	8	13	13
Maryland	11	8	10	Vermont	1	1	1
Massachusetts	48	70	83	Virginia	7	14	15
Michigan	15	10	12	Washington	8	12	12
Minnesota	10	13	14	West Virginia	5	5	5
Mississippi	4	19	25	Wisconsin	6	11	15
Missouri	8	10	13	Wyoming	0	1	1
Montana	5	7	9				

Total for U. S.	520	687	768
U. S. Poss.	26		
Hawaii		10	11
Panama and Virgin Islands		3	2
Philippines		5	5
P. R. and Cuba		6	6
Canada	27	37	43
Foreign	132	148	163
Total	705	896	998

It will be noted that there is a substantial increase in many of the states during the past year and it is possible with the help of more entomologists who are in a position by acquaintance and contact with potential subscribers, to further increase the list during the coming year.

I wish to thank all leaders for their cooperation and help during the year and at the same time to appeal for their continued aid during the ensuing year. We have realized a gain of 102 new subscriptions during 1922 and it is possible to make a better showing during the coming year in that many sources in some of the States and Provinces have not yet been intensively worked.

Respectfully submitted,

C. W. COLLINS, *Circulation Agent*

PRESIDENT J. G. SANDERS: We owe a vote of thanks to Mr. Collins for his fine work in increasing the number of subscriptions more than 100.

I will now read the report of the Executive Committee.

REPORT OF EXECUTIVE COMMITTEE

Following recommendations adopted at the last annual meeting, this committee has examined and audited the accounts of the Secretary and found them to be correct.

This committee has sanctioned the proposal of the Secretary to transfer five hundred dollars of the unexpended balance in the association account to the permanent fund.

J. G. SANDERS
J. M. SWAINE
M. C. TANQUARY
A. F. BURGESS
Committee

Voted that the report be accepted and the recommendations adopted.

PRESIDENT J. G. SANDERS: The next report will be presented by the delegate appointed to attend the conference to consider a Federation of American Biological Societies.

REPORT OF DELEGATE TO CONFERENCE CONCERNING FEDERATION OF BIOLOGICAL SOCIETIES

In November 1920 the Secretary of this Association was invited by Prof. A. Franklin Shull, Secretary of the American Society of Naturalists to attend a dinner

of the secretaries of the different Biological Societies during Convocation week at Chicago.

The invitation set forth the desirability of a conference concerning the arrangement of programs for the annual meetings in order to prevent conflicts, so far as possible, and to enable those attending to become better acquainted with the problems confronting the management of the different societies.

The meeting was held at 6.30 p. m., Dec. 27. The following gentlemen were present: Dr. C. E. McClung, then chairman of the Committee of Biology and Agriculture of the National Research Council, and the secretaries of societies, as follows: Prof. A. Franklin Shull, American Society of Naturalists, Prof. J. R. Schramm, Botanical Society of America, Prof. A. O. Weese, Ecological Society of America, Dr. J. M. Aldrich, Entomological Society of America, and the writer.

After the dinner was finished Prof. Shull stated his belief that much good could be accomplished by having the secretaries meet and discuss the problems that their societies were facing and that better arrangement for programs would probably be beneficial. He then called on Dr. McClung to preside.

The latter called attention to the independent nature of the different societies and suggested the desirability of closer relations, expressing the belief that this would be of benefit to all.

Prof. Schramm was called upon to discuss publications and presented data to show that costs of printing were too high and suggested the desirability of having one large publication which would serve all interests involved. This would make it possible to publish a larger edition and result in economy in printing. It was stated that this publication could be printed in sections which could be supplied to the members of the different societies covering the special lines in which they were interested. A common editorial staff would be necessary under this plan and the printing handled from one plant. It seemed probable that the cost of editing and management would be increased but the printing bill would be reduced.

Representatives of each society present were then asked to state the conditions and problems that confronted them, particularly with relation to programs and publications. It developed that most of the societies were experiencing difficulty in financing their existing publications and the need of more avenues to publish scientific work was stressed by some of those present It was stated that the National Research Council had during the year past advanced funds to assist in the publication of Botanical abstracts.

In the general discussion that followed the suggestion was made by some one that the remedy for these troubles could be secured by combining the societies so as to relieve the financial pressure.

It was decided that it was advisable for the secretaries to meet each year and discuss matters of mutual interest and the suggestion was made that the matters brought up should be talked over with the appropriate committee of each society.

After adjournment the writer brought up this matter at the meeting of the Committee on Policy of this association which was held later the same evening, but no action was taken.

No meeting of the secretaries of the societies, as such, has since been held. On June 3, 1921, a conference was held in Chicago between representatives of the American Society of Naturalists, American Society of Zoologists and Botanical Society of America, for the purpose of providing in each of these societies a section for

genetics. The conference discussed a plan for federating the Biological Societies and passed the following resolution: "That the Division of Biology and Agriculture of the National Research Council call a meeting of officers or representatives of biological societies to meet at Toronto to discuss the formation of a federation of Biological Societies."

The Division of Biology and Agriculture passed the following resolution at their meeting July 24, 1921.

"That the Executive Committee on behalf of the Division of Biology and Agriculture of the National Research Council call such a meeting of representatives of biological societies, extending invitations to the societies represented in the Division and such others as may be considered practicable."

Conforming to this resolution a call was sent out by the National Research Council to the President and Secretary or other representatives of Biological societies to attend a meeting and dinner Dec. 27, 1921, at Toronto.

Twelve societies together with Sections F, G and O of the American Association for the Advancement of Science and the Division of Biology and Agriculture of the National Research Council were represented by one or more members.

After a brief explanation it was voted as the sense of the meeting that the inter-society conferences should be continued to consider the feasibility of federation and to develop plans and that each society and the Sections represented should designate their president and secretary as members of an inter-society council which shall be authorized (1) to deal with all matters of common interest, such as coordination of programs, that are consistent with the existing regulations of the constituent societies and (2) to draw up proposals for a constitution and by-laws of a federation of the societies in question, and to present them for action at the next annual meeting.

It was also voted that the Division of Biology and Agriculture of the National Research Council be requested to call a meeting of the Council early in the spring. After listening to a discussion of the benefits of the proposed federation, publications and the correlation of meetings and programs, the conference adjourned for dinner.

In January 1922 a letter was received by me as Secretary of the Association from Dr. Frank R. Lillie stating that he had been requested by the chairman of the Division of Biology and Agriculture of the National Research Council to look after the program for the meeting of the inter-society council. With it was a list of topics which it seemed desirable to discuss at the conference and a request for suggestions. The topics dealt with—I. arrangement for programs of the different societies and II. the scope of a federation and the constitution and by-laws that appeared desirable. In reply I expressed approval of arrangements for making the programs more satisfactory but stated that I was not convinced that closer affiliation than that arranged for by the council would be of material benefit to this association. In view of the character of some of the questions suggested for discussion that intimated that a "one big society" was under consideration, I expressed the opinion that this association for more than 30 years had been an independent body and I had no doubt but what it would wish to continue as such.

In February a letter was received from Dr. L. R. Jones, Chairman Division of Biology and Agriculture, National Research Council, stating that the conference would be held in Washington, D. C., April 23. It stated that a decision had been reached to invite one representative from each society to attend instead of the presi-

dent and secretary as previously planned. This would result in reducing the expense of holding the conference.

The matter was referred to the President of the association and I was appointed to act in that capacity which explains why I am making this report.

Prior to the time of the meeting an agenda was received with a request that it be given careful thought.

The conference was attended by the following organizations: American Association for the Advancement of Science; Sections F (Zoology), G (Botany), N (Medical Sciences), and O (Agriculture); American Society of Naturalists; American Society of Zoologists; Botanical Society of America; Genetics Sections of the Botanical Society of America and the American Society of Zoologists; American Genetic Association; Ecological Society of America; American Phytopathological Society; American Society for Horticultural Science; Society of American Foresters; Society of American Bacteriologists; American Society of Agronomy; Entomological Society of America; American Association of Economic Entomologists; American Society of Animal Production; American Dairy Science Association; Federation of American Societies for Experimental Biology; The Executive Committee of the Division of Biology and Agriculture of the National Research Council.

Each of the above societies and sections were represented by one delegate and the executive committee of the Division of Biology and Agriculture of the National Research Council by 7 members.

The conference organized with Prof. L. R. Jones as chairman and Prof. A. Franklin Shull as secretary.

Professor F. R. Lillie explained the agenda that had been sent out and it was decided that plans for the annual meeting, with relation to programs, etc., should be referred to a committee consisting of the secretaries of the American Society of Naturalists, Botanical Society of America and American Society of Zoologists, who would co-operate with the permanent Secretary of the American Association for the Advancement of Science.

After a general discussion the following committee was appointed to consider the situation and report at the afternoon session: Frank R. Lillie, University of Chicago; C. W. Greene, University of Missouri; I. F. Lewis, University of Virginia; C. E. McClung, University of Pennsylvania; A. Franklin Shull, University of Michigan; R. E. Thatcher, N. Y. Agricultural Experiment Station, H. B. Ward, University of Illinois; and B. E. Livingston, representing the American Association for the Advancement of Science.

They presented the following recommendations, which were adopted:

1. That the vote of the Toronto conference in favor of the idea of federation be reaffirmed.

2. That the proposed federation be styled the Federation of American Biological Societies.

3. That the members of the federation be societies, not individuals, and that all societies represented in this conference be eligible to charter membership.

4. That a council of the federation be established, consisting of two representatives from each society, these to be the president and secretary unless otherwise designated by the society.

5. That the council choose an executive committee from its own membership.

The same committee was continued to draw up a constitution and by-laws and report early in the fall.

The conference was then addressed by Dr. Kofoid, Dr. Schramm and Dr. Vernon Kellogg, relative to biological publications, the latter discussing the situation concerning bibliographies with particular reference to European conditions. The following committee was appointed to consider the subject of biological publications in cooperating with a similar committee of the Division of Biology and Agriculture, National Research Council: A. P. Hitchens, Army Medical School; I. F. Lewis, University of Virginia; C. A. Kofoid, University of California; D. R. Hooker, Johns Hopkins University.

On August 4 and 5, 1922, the committee appointed to draw up a constitution met at Woods Hole, Mass. All members were present except Dr. Livingston whose place was filled by Prof. Herbert Osborn.

The committee adopted three principles to be observed in setting up relations with existing organizations, viz:

1. The federation should, for its benefit, utilize other organizations in accordance with their nature and purposes.
2. The federation should, on the other hand, so direct its policies and methods as to strengthen the efforts of organizations with which it is affiliated.
3. The federation should avoid unnecessary duplication of effort and expenditure.

The proposed constitution was published in *Science* Sept. 29, 1922. Copies have been sent to each active member of this association and a supply is available for the use of those present at this meeting.

It is assumed that the members have studied this constitution and are prepared to determine whether it shall be adopted and the Association take membership in the federation. I have recently been advised that the name has been changed to the Union of American Biological Societies.

The question that naturally concerns us is in regard to the anticipated benefits that will result from this union. Substantially the same question was asked at the last annual meeting and the reply of our representative on the National Research Council was that it would enable biologists to control their own literature and enable the secretaries to hold a conference to avoid conflicts in programs and arrange symposia of interest to all.

The objects as stated in the Constitution indicate the purpose is to stimulate biological investigations, organize and promote the interests of bibliographies and publication and to do those things of broad scope that the individual societies cannot do for themselves.

These objects are worthy but it is difficult to see how this Association will profit greatly as a result of this new organization. Recently the principal inducement to membership centers around the possibility of better publication facilities. Improvement along these lines is very desirable but involves financial backing which must come either from the societies or from outside sources.

Even if no profit accrues we should be willing to do our part in any movement that will benefit biology in general.

It is evident that most of the Societies do not have sufficient funds to finance their share of any elaborate program for publications but it is possible that outside sources might be willing to do so.

This association is in sound financial condition and with conservative management

should be able to gradually improve its condition so far as publications are concerned.

In the judgment of the writer there will never be a time when the cost of publication will be so cheap, or the avenues for publication so easily available that every member will be able to publish all that he may wish. The JOURNAL serves a useful purpose to the membership and it is doubtful whether it should be discontinued in order for it to be replaced with a larger publication handling general biological matter at a greater cost.

We are reasonably well served with bibliographies but this condition could be improved if more funds were available.

Abstracts would be a welcome addition to entomological literature but the field is so great that it is a questionable project for us under present conditions. The index of Economic Entomology might be slightly modified so as to give an indication of the scope of the articles cited in the references and thereby increase its usefulness.

We cannot enter this Union without being willing to assume our just share of the responsibilities, financial and otherwise.

As your representative I have consulted several members of the association to obtain their views as to the benefits to be derived by us and by biology at large from this union.

The constitution provides that the Council may recommend but not impose assessments and that membership may be terminated by official notification to the Council. This protects the societies from excessive financial burdens. On this basis, and in anticipation that the influence of biology will be extended by this new organization, I think this association is warranted in accepting membership.

Respectfully submitted

A. F. BURGESS

The report was received but action on the recommendations deferred until the report of the committee on policy had been presented.

PRESIDENT J. G. SANDERS: The next report is by our Representative to the National Research Council.

REPORT OF REPRESENTATIVE TO THE NATIONAL RESEARCH COUNCIL

The annual meeting of the Division of Biology and Agriculture for election of officers for the ensuing year, the consideration of reports of the sub-committees, and the transaction of general business, was held on April 22, in the Board room of the Carnegie Institution of Washington. Dr. F. R. Lillie of Chicago University was elected chairman of the division. A meeting of the Executive Committee of the Division of Biology and Agriculture was held on August 25, at the Marine Biological Laboratory, Woods Hole, Mass.

Space and time prevents an enumeration of the reports of the activities of the Division of Biology and Agriculture, several of which show that the Division has already accomplished some definitely desired ends. Relative to the efforts in behalf of entomology should be mentioned the establishment of the Crop Protection Institute with which more than two hundred fifty scientific men and more than a score of industrial concerns have allied themselves. The institute has made ar-

rangements for some fundamental investigation in sulphur for the control of insects and plant diseases. F. H. Lathrop, Associate Professor of Entomology and Assistant Entomologist of the Oregon Agricultural College and Experiment Station, has been appointed to the sulphur fellowship of the Crop Protection Institute. He entered upon his duties September 1, 1922, and is working under the direction of Prof. P. J. Parrott of the New York Agricultural Experiment Station. Mr. J W. Bulger, a graduate of South Dakota State College, with a Master's Degree from Ohio State University, 1922, was awarded the fellowship for the study of sulphur for the control of soil-infesting insects. Mr. Bulger is working under the direction of Dr. Herbert Osborn of the Ohio State University.

Under the Crop Protection Institute, cooperative dusting experiments have been carried out in the states of Pennsylvania, West Virginia, Connecticut, New York, Kansas, and Wisconsin. Details of the experiments and important results will be presented in various bulletins of the Crop Protection Institute. If time would permit, many illustrations could be given of splendid results acomplished by entomologists in these cooperative experiments, regional conferences, cooperating with industrial concerns and private agencies, all of which are fostered and supported by the Crop Protection Institute affiliated with the National Research Council. These conferences, which are stimulating interest in economic entomology and focusing attention on economic problems of outstanding importance, are almost certain to speed up research and experimental activities.

The meetings of the Division of Biology and Agriculture are not only a source of stimulation, but they also show very clearly that there is such an interrelation and interdependence of our problems in entomology with those of other fields in biology and science, that the development and solution of them cannot be considered separately without loss, and that the entomologist of the future will be required more than ever before to deal with problems involving interrelationships between many fields of science.

An invitation was extended to your representative on the National Research Council to attend the conference on Federation of the American Biological Societies, held on April 23, in the office of the National Research Council, Washington, D. C. This meeting was participated in by official representatives from the following organizations:

American Society of Zoologists
American Genetic Association.
American Society of Naturalists.
American Phytopathological Society.
Ecological Society of America.
Botanical Society of America.
American Society for Horticultural Science.
Society of American Foresters.
Society of American Bacteriologists.
American Association for the Advancement of Science, and its Sections G, F, O, and N.
American Association of Economic Entomologists.
American Society of Agronomy.
Entomological Society of America.
Federation of American Societies for Experimental Biology.

American Dairy Science Association.
American Society of Animal Production.

The conference, after considerable discussion, went on record in favor of a federation and appointed an executive committee to draw up a constitution to be submitted this winter at the annual meetings of societies represented in the federation conference. The report of this committee and the proposed constitution will be reported to this society by the Secretary and the Committee on Policy, together with the recommendation of the committee.

GEO. A. DEAN,
Representative of the American Association of Economic Entomologists to the National Research Council

Voted that the report be accepted.

PRESIDENT J. G. SANDERS: We will now hear the report of the Committee on Policy.

REPORT OF THE COMMITTEE ON POLICY

The Committee on Policy organized for the current year with the following Subcommittees:

EDUCATION—Dr. Ball, Chairman; Dr. Osborn; Mr. Dean.
INSECT CONTROL—Dr. Felt, Chairman; Mr. Burgess; Mr. O'Kane.
ORGANIZATION—Mr. O'Kane, Chairman; Mr. Sanders; Dr. Newell.
RESEARCH—Mr. Parrott, Chairman; Dr. Ball; Dr. Osborn.
PUBLICATION—Mr. Burgess, Chairman; Dr. Felt; Dr. Newell.

The Committee recommends that the Association enters the Federation of American Biological Societies under the proposed Constitution for such Federation as published in *Science* Vol. LVI, p. 359-361, Sept. 29, 1922, and that the Association maintain the designated representation of two members in this Federation at nominal expense. These representatives to be nominated by the Committee on Nominations.

The Insect Pest Survey is further commended by the committee, and greater cooperation on the part of all entomologists is urged.

The Committee affirms again its belief in the policy of thorough, deliberate, well-organized cooperation among federal workers, those employed in the various states and those who occupy similar positions in the Dominion of Canada. All problems in entomology are, to some extent, common to the workers in these various groups. Some problems cannot possibly be solved satisfactorily except through deliberate cooperation. The Committee believes that there should be:

(a). Conferences on specific problems of importance, these to be attended by all entomologists directly interested, no matter in what group they belong.

(b). Definite programs agreed on at such conferences with a full understanding of the major duties devolving on the several participants.

(c). A joint committee or council named by the conference, impartially constituted, and charged with the duty of helping to correlate work on the problem in question.

In the relations of industrial organizations to entomological work, the committee desires to express its confidence in the Crop Protection Institute. Experience is

proving that the plan under which the institute is organized is well chosen and that the Institute is in position to interest industrial concerns in entomological problems without prejudice, without risk of losing sight of scientific accuracy and with benefit to industry, to professional entomology and to the public welfare.

The Committee recommends that all entomologists become members of the Crop Protection Institute and give it their support and counsel.

The Committee offers this proposed amendment to the Constitution,—action on which will be taken at our next annual meeting.

ARTICLE II—MEMBERSHIP

SECTION 1. No change.

SECTION 2. Strike out this section and substitute the following: "The classes of membership shall be associate, active, fellow, honorary fellow and foreign."

SECTION 3. Strike out this section and substitute the following:

(a). ASSOCIATE. Associate membership may be conferred on persons who have done general or practical work in Entomology and who have published papers or otherwise have given evidence of their interest in such work. An application for associate membership shall be endorsed by two active members.

(b). ACTIVE. Active membership may be conferred on associate members who have been trained in entomological work and whose practical experience or published papers have evidenced their attainments in Entomology.

(c). FELLOW. Any member who has rendered exceptional service in Economic Entomology may be raised to fellowship rank.

(d). HONORARY FELLOW. Any fellow who has rendered distinguished and extraordinary service in Economic Entomology may be raised to honorary fellowship rank.

SECTION 4. No change.

SECTION 5. Strike out the section and substitute the following: "All classes of members, except associate and foreign members shall be entitled to vote in the general sessions. Associate members are entitled to vote only in the sectional meetings. All classes of members except associate and foreign shall be entitled to hold office."

SECTION 6. Strike out the section and substitute the following: "Membership of any class may be conferred at any regular meeting by a two-thirds vote of the members present, and on recommendation of the membership committee."

SECTION 7. Strike out the section.

With the proposed changes Article II—Membership—will read as follows:

SECTION 1. All economic entomologists, horticultural or apiary inspectors, employed by the General or State governments or by the State Experiment Stations, or by any agricultural or horticultural association, and all teachers of economic entomology in educational institutions and other persons engaged in practical work in economic entomology, may become members.

SECTION 2. The classes of membership shall be associate, active, fellow, honorary fellow and foreign.

SECTION 3. (a). ASSOCIATE. Associate membership may be conferred on persons who have done general or practical work in entomology and who have published papers or otherwise have given evidence of their interest in such work. An application for associate membership shall be endorsed by two active members.

(b). ACTIVE. Active membership may be conferred on associate members who

have been trained in entomological work and whose practical experience or published papers have evidenced their attainments in entomology.

(c). FELLOW. Any member who has rendered exceptional service in Economic Entomology may be raised to fellowship rank.

(d). HONORARY FELLOW. Any fellow who has rendered distinguished and extraordinary service in Economic Entomology may be raised to honorary fellowship rank.

SECTION 4. Foreign membership shall be honorary and shall apply only to members residing outside of the United States and Canada.

SECTION 5. All classes of members, except the associate and foreign members, shall be entitled to vote in the general sessions. Associate members are entitled to vote only in the sectional meetings. All classes of members except associate and foreign shall be entitled to hold office.

SECTION 6. Membership of any class may be conferred at any regular meeting by a two-thirds vote of the members present on recommendation of the membership committee.

SECTION 7. The Committee on membership shall be composed of fellows only.

BY LAWS

ARTICLE III—DUES

Section I is changed to read as follows:

The annual dues of associate and active members and fellows shall be one dollar and fifty cents, which shall be payable in advance. No dues shall be payable from honorary fellows and foreign members. Annual dues shall not include subscription to the JOURNAL OF ECONOMIC ENTOMOLOGY.

ARTICLE IV—MEETINGS

SECTION IV. Strike out No. 8 and No. 1 under the subheading "at the following session," These numbers fixing the time of the annual address of the president and the discussion thereof.

GEO. A. DEAN	HERBERT OSBORN
J. G. SANDERS	P. J. PARROTT
A. F. BURGESS	W. C. O'KANE
WILMON NEWELL	E. D. BALL
E. P. FELT	*Committee on Policy*

PRESIDENT J. G. SANDERS: I wish to state that the proposed changes to the constitution and by-laws are merely read at this time and that they will come up for action at the next annual meeting after having been published in the JOURNAL.

Voted that the report be accepted.

PRESIDENT J. G. SANDERS: The Trustees of the Crop Protection Institute will now make a report.

REPORT OF THE BOARD OF GOVERNORS OF THE CROP PROTECTION INSTITUTE

The organization of the Crop Protection Institute remains as it was last year. It is controlled by a Board of Governors of nine men, three of whom are named by this

Association, three by the American Phytopathological Society, two by the Association of Official Agricultural Chemists, and one by the National Research Council.

On the Board of Governors station directors are represented, as it is now constituted, since both of the men named by the Agricultural Chemists are directors of stations.

Mr. Paul Moore is now Secretary of the Crop Protection Institute, being named on the Board by the National Research Council. The Treasurership is now the same as that of the research Council. All funds are handled through the regular machinery in the office of the Bursar of the National Research Council.

The industrial activity of the Institute has been widening and strengthening. The work of the Institute has gradually assumed a project aspect. By that I mean that its major activities are developing along lines of definite projects which are underwritten by specified funds made available to the Institute from various sources.

It has strengthened its research aspect. It has now two well supported active projects on hand which are almost entirely research in their aspects. That does not mean that there are not other aspects besides those of research, but wisely and properly research is coming to have a prominent part in its plans and activities.

The active projects are as follows:

1. Sulphur Investigations. The plans for these were completed this year. The fellowships are supported by the three large sulphur producing companies of this country—The Texas Gulf Sulphur Co., Union Sulphur Co., and the Freeport Sulphur Company. These united with the institute in a joint agreement, by which they are supporting research for a period of two years, at a total appropriation of fifteen thousand dollars. A special committee of the Board of Governors of the Institute is in charge of that research. This committee placed the proposition before station directors and some presidents of universities east of the Rocky Mountains, and were offered very substantial support by more than fifteen directors of stations and universities.

Two men were selected as investigators. The project was divided into two parts —the entomological aspect and the fungicidal aspect. Mr. F. H. Lathrop is the investigator in charge of the entomological aspect and Mr. H. C. Young is in charge of the pathological aspect.

It is a pleasure to say that unusual progress has been made in this work. The fungicidal aspect was begun first and Mr. Young has already worked out fundamental facts of great importance in the use of spray materials containing sulphur. Some of these discoveries will be set forth in a paper which will be read this afternoon before the plant pathologists and will be published as a bulletin by the Crop Protection Institute. I may indicate informally, that the data show that lime sulphur is a fungicide in a peculiar and unsuspected way, that its original caustic action is its first and most prominent fungicidal action, and that further fungicidal effects are due solely to precipitated, finely divided sulphur and not at all to the various compounds of sulphur in the material, as we had supposed before this.

The entomological aspect of the sulphur investigations is developing substantially. The Board is confident that both of these investigations will lead definitely to facts that are of great importance to our professional work and to that of the plant pathologists.

In this and in some other work that the Institute undertakes it seeks such expert counsel as may be available in industrial organizations. For example, the sulphur producing companies are represented in their contacts with the Institute by Dr.

Raymond Bacon, formerly a director of the Mellon Institute; by Dr. C. M. Chapman, another expert engineer; and by Mr. W. M. P. Taylor, who has been conducting certain experimental work. The Institute is keeping in touch with these men and is securing valuable help from them.

2. The second active project now provided for is an investigation of Scalecide, especially as to its possible effect on fire blight, on rate of twig growth, on borers, on the eggs of aphids and mites, and other problems. This is provided for in a three year contract with the B. G. Pratt Company, involving an appropriation of $13,500; or $4500 per annum. The Board expects to select immediately an investigator who will be set to work on this project. Various phases of the study will be located in various states; probably in three besides that in which the investigator himself is at work. Funds are available for carrying on related, corroborative work in these several states.

The status of this work is typical, I think, of what the Crop Protection Institute proposes to undertake in other instances. A procedure that shall apply to any such undertakings has been drawn up by the Institute with great care, in consultation with the authorities of the Department of Agriculture at Washington. This procedure provides safeguards that we believe will fully protect any investigation of this nature, supported by industrial funds, from bias or from the dangers that might arise in such support. Complete control of such projects, including the choice of investigators and all other details lies with the Board of Governors of the Institute, named by the national societies, as already described.

3. The third active project for which funds have been provided is that supported by the Tanners' Council of the United States, looking toward a program of control of the ox warble. Their appropriation is $9,000 and is contingent on additional funds which are in process of being secured.

There are pending projects that might be mentioned in detail, but it will perhaps suffice at this time to indicate that there are substantial undertakings in prospect, some of which I think will materialize soon.

The other general aspect of the work of the Institute is that of cooperative projects handled without specific appropriations but under such general funds as the Institute has. These consist largely in correlating certain work undertaken by various entomologists and plant pathologists.

For instance, we have finished a second year of orchard dusting experiments, involving five localities in as many states. We have carried out, this season, experimental treatment of cereal grains for smuts in some fifteen different states and provinces. We have conducted experimental treatment of seed potatoes. We have started a cooperative project in potato dusting, and so on.

I feel that in general the Institute is winning its way forward to a substantial contribution to entomology and to plant pathology. It needs your active cooperation and your counsel. It is impossible, obviously, for most of the scientific members to attend the annual meetings. That is unfortunate and ought to be otherwise. You can, however, write your views, your comments, your criticisms and your suggestions, to the Secretary or to the Chairman, and they will be welcome.

W. C. O'KANE
Chairman

Voted that the report be accepted.

PRESIDENT J. G. SANDERS: The report of the Committee on Nomenclature is now in order.

REPORT OF THE COMMITTEE ON NOMENCLATURE

Your committee, in attacking the project delegated to it, has employed tactics which are possibly a little unusual. It has given its attention not only to the compilation of a list of names but to the more fundamental conceptions of name formation and growth. Study has been given to suggestions submitted by various entomologists and editors, to dictionaries of the English language and to certain papers on Semantics. In fact an attempt has been made to review, in a preliminary way, the entire subject of the popular names of insects.

The position has been taken that, first of all, names born naturally should be favored and that any operative procedure in bringing names into being should be resorted to only when such natural born names are unavailable. It is further believed that since these names are for popular usage the question of academic entomological exactitude is less vital than that of simplicity and utility.

A preliminary examination has shown that no uniform system has heretofore been adopted in the consideration of the subject, inconsistencies of many kinds being at once evident. These were especially noted in the orthographic form of the compounds passed upon or suggested. While it is realized that rules for the form of compounds are scarcely traceable either in the ancient or modern periods of the English language it is felt that some plan of work should be prepared as a first step.

The use of the hyphen appears to have developed at about Shakespeare's time. In old English manuscripts such as those published by the Chaucer Society it is unknown. In the original edition of Shakespeare, on the other hand, the hyphen is excessively used, while Dr. Johnson used it in most common words in his dictionary and ran together unusual compounds such as ploughmonday.

Modern English usage is extremely irregular. In fact even on the same page of the same work one may find variable usage. The tendency, however, seems to be to hyphenate with first element stress or with a syntactical group as the first element. The modern tendency of printers appears to be to omit hyphens if authors permit and we have seen papers in which even the periods were not printed.

The fact that, during the past year, twenty or more members of this Association have given considerable thought and time to co-operative work on the project delegated to this committee, would indicate that the matter of common names is of general interest.

1,000 names, compiled from practically all the available American publications on economic entomology, have passed through the hands of systematists for the purpose of bringing the scientific names up to date. The list has been widely circulated. Every member of the Association who has expressed either a desire or a willingness to see the list has been supplied with a copy.

The present status of the list is what would logically be expected from a compilation; it represents, in an impartial way, the inconsistencies to be found in our entomological publications (past and present).

To edit this list of 1,000 names would be a haphazard performance without the use of rules to serve as guides in the choice and construction of the common names. Such rules should be basic enough to satisfy not only the present need but to serve future committees in the same capacity.

The present committee does not understand that it has authority to proceed in this manner without the expressed sanction of the general Association. If the Association is willing to vote to accept as rules for guidance in regard to common names, the list of suggestions hereto appended and forming part of this report which has been distributed for examination previous to this meeting, the committee thinks that the task assigned to it two years ago can proceed without further delay.

The present committee does not understand that it has been commissioned to modify (except editorially) any common names previously adopted by the Association. In certain cases such names are now known to be incorrect through misidentification or similar cause. Other names prove to be too cumbersome; and still others, even though simple, have not met with any universal usage. The committee, therefore, recommends that it be given authority to review the official lists and resubmit them with the new list prepared.

The editorial work on the list under consideration requires a very considerable amount of conference. Such conference is not possible among entomologists so widely distributed as are the members of the present committee. The committee, therefore, recommends that the Committee on Nomenclature be enlarged by four of the entomologists residing in Washington, Messrs. A. C. Baker; A. N. Caudell; J. A. Hyslop, and S. A. Rohwer, who have greatly aided the committee during the past year. This would make it possible to refer to taxonomists points of nomenclature, without the loss of time previously experienced; and would facilitate consultation on various matters important to the work of the committee.

Respectfully submitted,

EDITH M. PATCH
ARTHUR GIBSON
Z. P. METCALF
Committee

SUGGESTED RULES

In preparing a set of rules as a first step in the study of names no attempt has been made to reflect the visible tendencies of modern English. Indeed this would be impossible. It is believed, however, that only such rules have been formulated as will give a better sense conception, and that the result of their application will not be far from the usual English usage.

Rule 1.—A common name should be given only when the insect is of particular interest on account of its economic importance, its striking appearance, or its abundant occurrence.

2.—When feasible a common name, used in any publication, should be accompanied by a reference to the scientific name. (This stand is taken because of the fact that the literature of entomology is international; and publications, even though popular, are often consulted by students outside our own colloquial sphere).

3.—A common name should, in general, be of two parts: one part indicating the family, group, or class to which the insect belongs; and the other a modifying part, limiting this to a specific insect. *Examples:* Striped blister-beetle, terrapin scale, fall armyworm.

4.—In compounding words the hyphen should be used to connect words which together form the group name; except when the last part of the name indicates an incorrect systematic group or when it is a noun implying an intransitive action, in

which cases no hyphen is to be used. *Examples:* Stink-bug, flea-beetle, leaf-miner, leaf-roller, twig-girdler, armyworm, sawfly, grasshopper, treehopper, froghopper, waterstrider.

5.—The hyphen should not be used to connect the group name and the modifying name. *Examples:* Bean weevil, yellow mealworm, hop aphid, plum curculio.

6.—When two or more words, expressing one idea, are included in a modifying part of the name, these words should be connected by the hyphen. *Examples:* twelve-spotted cucumber-beetle, grape-berry moth.

7.—When two distinct ideas are expressed in the modifying part of the name the hyphen should be omitted between the words representing these separate ideas. *Examples:* Round-headed apple-tree borer, Florida red scale.

8.—Group names:

The use of systematic group names as a basis for common names should be discouraged. *Examples:* Green diabrotica, two-spotted doryphora, oak eriococcus.

When a well known English name exists for a group, family or a number of insects with similar habits or similar characteristics, it should be used in preference to any other. *Examples:* Beetle, weevil, walkingstick, scale, leaf-roller.

9.—Modifying words:

The modifying names should be based, if possible, on some outstanding characteristic of the insect; and the direct translation of other than descriptive specific names should be avoided. *Examples:* (satisfactory) oyster-shell scale, two-striped walking-stick; (unsatisfactory) Abbot's sawfly, Baker's mealy-bug.

The modifying name may be based on a geographic region which constitutes the original home of the insect or in which it first attained economic importance, but the adoption of such names is to be discouraged. *Examples:* Oriental peach moth, American cockroach, San Jose scale, Japanese beetle.

The modifying name may be based on a co-relation between the insect and its host. *Example:* Emasculating bot-fly.

The modifying name should not be based on the name of an insect's host unless this host is known to be its outstanding and important one, *Examples:* Pear thrips, wheat midge, cabbage aphid, corn billbug not chufa billbug.

10.—More than one host-plant should not be used in a common name. *Examples:* Plum and thistle aphid.

11.—While in certain exceptional instances it may be advisable to sanction two different common names for the same insect, this is objectionable and a practice to be avoided. *Examples:* Bollworm, corn earworm: cotton aphid, melon aphid.

12.—Names already in common use should be retained in so far as is possible; but they should be made to agree in formation with the recommendations in paragraphs 3–7 inclusive.

Mr. E. P. FELT: I move that the report be accepted and the recommendations of the committee be approved.

Mr. S. B. FRACKER: I would like to amend the motion so as to indicate that it is the sense of this meeting that the use of the hyphen in common names of insects be eliminated to as great an extent as the committee finds feasible.

The motion as amended was carried.

PRESIDENT J. G. SANDERS: We will next have the report of the Committee on Index of Economic Entomology.

REPORT OF THE COMMITTEE ON THE PUBLICATION OF THE INDEX OF AMERICAN ECONOMIC ENTOMOLOGY

Your Committee has kept in touch with developments during the past year and has not felt justified in attempting the publication of an Index prior to the expiration of a five year period. There are several bibliographic enterprises in operation or projected and so far they have not rendered an Index of economic entomology unnecessary.

The Report of the Secretary gives the financial details for both Index I and Index II and on referring thereto, it will be seen that the status of the project is very satisfactory and that soon a substantial balance will be available to assist in the publication of another volume.

Your Committee concurs in the advisability of publishing the Index at the end of the five year period unless developments in the near future make a change in plan advisable. In view of this, it is recommended that the Committee be continued and directed to make such plans as may be necessary to insure the publication of the next Index shortly after the expiration of the period to be covered.

Respectfully submitted
E. P. FELT
A. F. BURGESS
W. E. BRITTON
W. C. O'KANE
W. E. HINDS
Committee

Voted that the report be accepted and the Committee continued.

PRESIDENT J. G. SANDERS: There will be no formal report from the Committee on U. S. National Museum.

In accordance with the vote of the association at the Toronto meeting, the Committee on Resolutions was appointed by the President more than a month ago, with the following membership: Dr. W. E. Britton, Chairman; L. S. McLaine and E. C. Cotton.

I will now appoint the Committee on Nominations, as follows: R. A. Cooley, Chairman; Wilmon Newell and D. M. DeLong.

At this point the President read a letter received by the Secretary under the date of December 21, from the Managing Editor of *Popular Science Monthly* expressing interest in entomological research and suggesting that there might be members of our association who would be interested in preparing popular articles on current entomological developments for that publication. He also read a letter from T. A. C. Schoevers, Wageningen, Holland, who is Secretary of the Inter-

national Conference of Phytopathology and Economic Entomology, which will be held in Wageningen, Holland, June 25 to 30, 1923, and requested that representatives from this association be sent to the conference.

It was voted that the Executive Committee be authorized, in its discretion, to appoint a delegate to attend the conference.

SECRETARY A. F. BURGESS explained the details of arrangements for the different sessions and stated that a very complete exhibit illustrating the corn borer work, gipsy moth work, and the operations at the vacuum fumigation plants supervised by the Federal Horticultural Board in Boston, had been prepared and were in a nearby room. An exhibit by members of the Entomological Society of America was also in the same room. In arranging for the meeting it seemed impractical to provide for a visit to the corn borer laboratory and the gipsy moth laboratory on account of lack of time and possibility of bad weather, and the exhibits above-mentioned have been prepared in order to replace such an excursion.

At this point the session adjourned and reconvened at 1.45 P. M.

PRESIDENT J. G. SANDERS: We will now take up the proposal to enter the Union of American Biological Societies.

Mr. E. D. BALL: I move that this association join the proposed Union.

After the motion had been seconded, Mr. Ball stated that several associations had already ratified the proposed constitution and that he had been told within the last two or three hours that it was practically certain that if it was ratified by all the associations so as to make the project large enough to be worth while, that there is $2,000,000 available for publication of a bibliographic publication. He stated that it was not possible to get this fund unless there can be a union of all the biological societies; in case this is brought about, however, it is practically certain that there will be an endowment to make a permanent bibliographic Journal.

Mr. L. O. HOWARD: The American Association for the Advancement of Science this morning approved the movement on condition that all the societies join.

SECRETARY A. F. BURGESS: I think it is very gratifying to hear the announcement Dr. Ball has just made in regard to the possibility of endowment because one of the prime difficulties has been the financial one and up to the present time there has been some uncertainty as to just how that could be worked out. It adds a good deal of impetus and

stability to the project to have it known that there is to be a source of adequate financial backing.

The motion was carried.

FINAL BUSINESS

The final business was transacted Saturday afternoon, December 30.

PRESIDENT J. G. SANDERS: Is the Committee on Resolutions ready to report?

REPORT OF COMMITTEE ON RESOLUTIONS

1. *Resolved*, That the Insect Pest Survey is and may continue to be of much benefit to entomologists and crop producers, and that it should be continued over a period of years and perfected to bring it to its maximum degree of efficiency.

2. *Resolved*, That the Secretary consider the advisability of grouping together papers on allied subjects, and that two or more groups of this association may be held simultaneously so as to permit more time for the discussion of papers, and also that he arrange for a symposium on subjects of personal or general interest to the members of the association as a whole.

3. *Resolved*, That it is the sense of this association, that a uniform United States tag should be required to permit interstate movement of nursery stock and that the machinery necessary to the qualifying inspection should be worked out co-operatively between the United States Department of Agriculture and the authorities of the various states.

4. *Resolved*, That this association favors continued co-operation between the United States and Canadian Governmental authorities for the control of imported insect pests and also between the Federal authorities and the States for the same purpose.

5 *Resolved*, That this association recognizes at this time that the Japanese Beetle is a very serious menace to the agriculture and horticulture of the United States, and urges that every possible effort be made to restrict its spread.

6. *Resolved*, That this association records itself as favoring the plan of maintaining a barrier zone extending from Long Island Sound to the Canadian border, west of which the gipsy moth shall not be allowed to establish itself, and that a similar barrier zone be maintained in Canada.

7. *Resolved*, That this association appreciates the serious menace offered by the continued spread of the European Corn Borer and favors the expenditure of all the available means and resources which promise to prevent or delay the spread of this insect to the corn belt areas, especially careful quarantine administration and repressive work in the western infested areas surrounding Lake Erie are believed to be particularly important, also the possibility of commercial spread of the insect from the two generation colony in New England to the corn belt states should be given proper consideration.

8. *Resolved*, That this association expresses its high appreciation regarding the very instructive exhibits, particularly of the gipsy moth and European Corn Borer. Such exhibits are of great educational value and should be arranged in connection with these meetings wherever and whenever possible.

9. *Resolved*, That the thanks of this association be hereby extended to the Massachusetts Institute of Technology for furnishing place for meetings and exhibits, and to Professor Prescott and his associates on the local committee for making arrangements, and to the press for reporting, all of which have contributed toward the success of this meeting.

Respectfully submitted,
W. E. BRITTON
L. S. MCLAINE
Committee

Voted that the recommendations be adopted.

Prior to final vote, Mr. E. P. Felt briefly explained Resolution 6 relative to the selection of a barrier line to prevent further spread of the gipsy moth, and Mr. E. D. Ball cited the recent work in New Jersey to indicate that this plan was feasible.

PRESIDENT J. G. SANDERS: The next in order will be the report of the Committee on Membership.

REPORT OF COMMITTEE ON MEMBERSHIP

The committee on membership submits the following report:

1. It recommends for election to associate membership,—

(The addresses will be found in list of members)

Alcazar, Manuel
Alexander, C. P.
Amis, A. H.
Ashworth, J. T.
Barnes, D. F.
Basinger, A. J.
Bigger, J. H.
Bissell, T. L.
Blake, D. H.
Boldyrer, Vassily F.
Buys, J. L.
Corkins, C. L.
Cowles, R. B.
Craighead, F. C.
Crumb, S. E.
Cutright, C. R.
Dunnam, E. W.
Ellington, G. W.
Ellis, R. C.
Fitch, H. W.
Flebut, A. J.
Fletcher, R. K.
Gable, C. H.
Gardner, T. R.
Gibson, L. E.
Glasgow, R. D.
Good, H. G.
Graves, F. W., Jr.
Hartley, E. A.
Hobson, R. T.
Holdridge, F. L.
Hough, W. S.
Ingram, J. W.
Jaynes, H. A.
Johnson, J. Peter
Keen, S. E.
Keyes, Elizabeth
Lange, R. C.
Langford, G. S.
MacLeod, G. F.
McClendon, S. E.
McIndoo, N. E.
Mickel, C. E.
Mitchener, A. V.
More, J. D.
Murray, M. A.
Noble, W. B.
Palmer, J. B.
Parker, R. L.
Patch, L. H.
Patts, S. F.
Remy, T. P.
Rogers, Leslie
Rohwer, S. A.
Roullard, F. P.
Sanders, P. D.
Sechrist, E. L.
Sibley, C. K.
Smit, Barnard
Smith, H. D.
Smyth, E. G.
Spencer, G. E.
Spencer, G. J.
Stirrett, G. M.
Sturtevant, A. P.
Sutton, F. J.
Vance, A. McC.
Vorhies, C. T.
Van Leeuwen, E. R.
West, L. S.
Wymore, F. H.

2. The committee recommends for re-instatement to associate membership,—

Babcock, K. W.	Runner, G. A.	Vaughan, E. A.
Frost, H. L.	Tillery, J. L.	

3. The committee recommends for transfer from associate to active membership,—

Allen, H. W.	Hill, C. C.	Reinhard, H. J.
Baerg, W. J.	Horsfall, J. L.	Smith, R. H.
Cartwright, W. B.	Knull, J. N.	Watson, J. R.
Champlain, A. B.	Laake, E. W.	Webber, R. T.
Claassen, P. W.	Leach, B. R.	Wellhouse, Walter
Crawford, H. G.	Marcovitch, S.	White, W. H.
Drake, C. J.	Mote, D. C.	Williams, C. B.
Dudley, J. E., Jr.	Muesebeck, C. F. W.	Young, D. B.
Fluke, C. L.	Porter, B. A.	
Gentner, L. G.	Reed, W. V.	

4. The committee recommends that the resignation of the following members be accepted,—

Henderson, W. W.	Neuls, J. D.	Wehr, E. E.
Lobdell, R. N.		

5. And finally the committee recommends that the 6 active and 20 associate members who are in arrears for dues for two years past, be notified that if these dues are not paid within a reasonable length of time, that the Secretary be instructed to drop the names of these members from the roster of this association.

Respectfully submitted,
A. G. RUGGLES
J. S. HOUSER
GEO. G. AINSLIE
Committee

Voted that the report be accepted.

PRESIDENT J. G. SANDERS: We will now have the recommendations of the Advisory Committee of the JOURNAL for officers for that publication.

Mr. L. O. HOWARD: The Advisory Committee have instructed me that they are unanimously in favor of continuing the present officers, as follows: Editor, E. P. Felt; Associate Editor, W. E. Britton; Business Manager, A. F. Burgess.

Voted that the recommendations be adopted.

PRESIDENT J. G. SANDERS: We will now have the report of the Committee on Nominations.

REPORT OF THE COMMITTEE ON NOMINATIONS

Your committee appointed to nominate officers for the American Association of Economic Entomologists for the year 1923 respectfully reports as follows:

For President, Prof. A. G. Ruggles, St. Paul, Minn.

For First Vice-President, Prof. H. A. Gossard, Wooster, Ohio.

For Second Vice-President, Prof. H. J. Quayle, Riverside, Calif.

For Third Vice-President, Mr. P. A. Glenn, Urbana, Ill.

For Fourth Vice-Preisdent, S. B. Fracker, Madison, Wisc.

For the Committee on Membership for the term expiring 1925, Dr. W. E. Britton, New Haven, Conn.

For the Committee on Policy for the term expiring 1927, Dr. J. M. Swaine, Ottawa, Canada.

For Committee on U. S. National Museum for the term expiring 1927, Dr. O. A. Johannsen, Ithaca, N. Y.

For Representative to the National Research Council, Prof. George A. Dean, Manhattan, Kan.

For Councillors for the American Association for the Advancement of Science,
Dr. T. J. Headlee, New Brunswick, N. J.
Dr. L. O. Howard, Washington, D. C.

For Trustee for the Crop Protection Institute for the term ending 1925, Prof. P. J. Parrott, Geneva, N. Y.

For additional members of the Committee on Nomenclature,
Mr. J. A. Hyslop, Washington, D. C.
Mr. A. N. Caudell, Washington, D. C.
Mr. A. C. Baker, Washington, D. C.

We also recommend that Mr. S. A. Rohwer, Washington, D. C., be invited to co-operate in the work of this committee.

For Representatives to the Council of the Union of American Biological Societies,
Dr. A. L. Quaintance, Washington, D. C.
Dr. William Moore, Riverton, N. J.

For the Journal Advisory Committee for the term expiring 1925,
Dr. E. F. Phillips, Washington, D. C.
Prof. G. F. Ferris, Stanford University, Calif.

Respectfully submitted,
R. A. COOLEY
WILMON NEWELL
D. M. DELONG
Committee

It was voted that the Secretary be instructed to cast one ballot for the names recommended by the committee.

Carried.

The ballot was cast and the officers were declared elected.

PRESIDENT J. G. SANDERS: Is there any miscellaneous business?

SECRETARY A. F. BURGESS: We have held a joint meeting with the Phytopathologists for three years and the secretary of that society spoke to me this morning in regard to plans for the future.

I suggested that he consult the members of his society and I would consult this association in regard to the matter. I think it would be well to get an expression from the members here as to what they would like for a symposium at a joint meeting.

PRESIDENT J. G. SANDERS: It seems to me that we can find some topic for discussion next year that would be beneficial to both societies.

Mr. W. C. O'KANE: I was one of those who was very much in favor of a joint meeting with the Phytopathologists. I do not believe we necessarily need to have a joint meeting every year unless there is obvious reason for it. If it is difficult to find a subject, I do not think it would be harmful to omit the joint meeting one year.

I move that the question of joint meeting be left to the Secretary or the Executive Committee, as the plans may develop in the next few months.

The motion was carried.

SECRETARY A. F. BURGESS: The Committee on Resolutions recommended that the Secretary provide a symposium at the next annual meeting. It would be helpful if members would send in subjects that they think could be used in a symposium.

At this time I would like to offer an amendment to the constitution which, of course, will lay over for action until the next annual meeting.

Amend Article 2 of the Constitution by adding "Any member who shall pay to the association the sum of $100 may be made a life member and shall thereafter be exempt from dues and shall be furnished the JOURNAL OF ECONOMIC ENTOMOLOGY without further charge."

Mr. W. E. BRITTON: I move a vote of thanks to the President for presiding so nicely at this meeting and making so many suggestions for our mutual benefit.

Carried.

PRESIDENT J. G. SANDERS expressed his thanks to the association and also his appreciation of the work done by the Secretary in making the meeting a success.

He then requested Past Presidents Felt and Cooley to escort Mr. A. G. Ruggles, President-elect, to the Chair.

He then presented him with the gavel belonging to the association and wished him success during the coming year.

PRESIDENT-ELECT RUGGLES thanked the association and promised to use his best efforts for the benefit of the association.

SECRETARY A. F. BURGESS: I move that the time and place of the

next meeting be the same as that of the American Association for the Advancement of Science.

The motion was carried.

Mr. L. O. HOWARD stated that the next meeting would be in Cincinnati and the meeting the following year in Washington.

There being no further business, the meeting was adjourned at 3.30 P. M.

A. F. BURGESS,
Secretary

PART II, ADDRESSES, PAPERS, AND DISCUSSIONS

Afternoon Session, Thursday, December 28, 1922

At the close of the business session, President Sanders called upon Past President Cooley to preside.

PAST PRESIDENT COOLEY: We will now listen to the annual address of our President.

WHITHER IN ENTOMOLOGY

By J. G. SANDERS, *Harrisburg, Pa.*

ABSTRACT

Predictions for the future are extremely hazardous in spite of the wonderful progress of the past thirty-five years. Our present day knowledge of Entomology should be more generally utilized in the schools, particularly the lower grades, since this will develop in the coming generation a more open mind toward improved methods. There is need in Entomology for men with breadth of training, deep convictions, lofty purposes and persevering ingenuity, men who believe in the profession and are capable of convincing others. Do the present day Entomologists compare favorably with the wonderful early workers, both in results and the relative cost of investigations? Is there a desirability of segregating more sharply the experimental and control or police phases? The remarkable results obtained in heat control, vacuum fumigation, etc. open tremendous new fields with numerous practical applications. Preventive control of insects, akin to preventive medicine, has possibilities of great development.

The honor of election to the presidency of an association of one's peers in his favored branch of science demands more than common thanks, more than average effort, more than complacent compromise and more than meaningless statement. The opportunity which you have afforded me at this thirty-fifth annual meeting, I am most happy to accept by offering some thoughts and convictions relative to the growing demands,

the encouraging outlook and the attainable station of Entomology among allied branches of science and in world activities generally. Altho considerable intermittent thought has been directed to the subject above, it is but natural to regret that a panacea cannot be found to ameliorate and remedy the many difficulties which are most certainly encountered in the pursuit of our profession wherever and however one may be engaged.

A review of wonderful accomplishments and of work replete with charm and precision in the past thirty-five and more years under limitations which often seriously hampered the progress of our most determined workers is most reassuring, but one who boldly tries to look into the future places himself in a precarious and assailable position, particularly if he should take liberties with the pet theories and beliefs of his peers. However, it can be asserted fearlessly that every thinking economic entomologist, be he veteran or novice, has experienced moments of misgiving and of conservative contemplation on what the future holds for his branch of science and for himself as a participant in its development. Would that I had the remarkable foresight of a Tennyson who in his "Locksley Hall," written in 1842, foretold "the nations' airy navies grappling in the central blue," and following on a few lines in the same poem wrote the oft quoted words—"Science moves, but slowly, slowly, creeping on from point to point." Just below we find another finely calculated thought as follows—

> Yet I doubt not thro' the ages one increasing purpose runs,
> And the thoughts of men are widen'd with the process of the suns
> Knowledge comes, but wisdom lingers, and I linger on the shore,
> And the individual withers, and the world is more and more.

In line with Tennyson's thought and doubtless in accordance with the procession of time, each of us shall play his part, add his mite to the sum total and finally move on. But how large and of what weight and influence shall the individual contributions be? Will they hinder and retard normal development or will they accelerate and quicken the pulses of our activities, rapidly, accurately, and with painstaking nicety fitting into the great scheme of world advancement? Is our chosen branch of science to remain in its present somewhat somnolescent state in which its very name is everywhere misspelled and its scope is but vaguely understood and generally misapprehended, or shall we adopt reasonable, efficient and palatable methods to attract and hold the public in a profoundly interesting and gripping study of living creatures? Altho the major development of our science has been contemporary with that of

bacteriology, have we, generally speaking, approximated the publicity secured to the latter? Yet we are for the most part dealing with creatures visible to the unaided eye and of most remarkable coloration and conformation, and which lend themselves readily to observation, study and a reasonable accumulation of knowledge thereof. It should be our legitimate desire to force our present day knowledge of entomology into our public schools, especially in the lower grades where early impressions will be strong to continue science study, so that the distaste for natural science so evident in higher grades, due largely to the average uninterested teacher's method of giving medicinal doses of science from a textbook, may be avoided.

In that phase of economic entomology pertaining to definite pest control, remarkable advancement has been achieved, and our knowledge of practical control covers a wide range of methods, which surely are easy of application and entail but slight expense in comparison with the benefits to be derived. But with all this amazing fund of knowledge available to the entomologist, we are startled on every hand either with the sublime indifference of the layman or his complete ignorance of facts. One realizes afresh this amazing ignorance of otherwise educated people every time he mentions the subject of entomology in public, and honestly senses his efforts to educate as well-nigh fruitless. Shall we not realize and confess here and now that a permanent barrier and handicap to a general diffusion of knowledge of insects and pest control will exist so long as we permit our children to grow to mature years without a reasonable fundamental knowledge of the simpler characteristics of insects and their habits coupled with an appreciation of damage wrought by them. Can we not see the very distinctive advantage in broadcasting advice on control of a new pest if our efforts were expended on individuals whose minds were partially prepared and receptive?

There is in course of preparation in the Pennsylvania Department of Education a compilation of elementary science studies submitted by scientists in various institutions, which will be edited and unified by the Director of Science Study for the purpose of introduction in the secondary schools of the state. These science studies, illustrated consistently with experiments and visual tests of easily obtainable materials, thoroughly yet concisely explained step by step, we believe will serve to open a new world to the younger children, and acquaint them in a pleasing and attractive manner with nature's methods and her creatures. Then can we not safely predict when hundreds of thousands of these informed children have grown to manhood and womanhood they will accord a more

hearty reception to our pest control preachments, and they in turn encourage and inspire our efforts to lessen and lower the heavy tax burden created and maintained annually by pests. The outlook for this field of effort is highly encouraging and once started and maintained for a few years should gather great momentum. At the outset the greatest care must necessarily be maintained to prepare the lessons and experiments so that they will be attractive, entertaining, and finally, powerfully instructive. To succeed in this program, the right men must meet the complex problems in an open-minded manner and patiently continue the endeavor in spite of recurring apparent failures. This brings me to another phase of this paper which I wish to discuss hopefully.

The entomologist, as a trained man in natural science, is to receive consideration in a symposium later in our program. In arranging this phase of our program the speaker was highly gratified with the ready and willing responses to his call for the several tasks, and it is our belief that the selection by the association of this generalized subject for a symposium will be amply justified.

Entomology is not unique among other sciences or professions, in that its outstanding need is for real men, with breadth of training, with deep convictions, with lofty purpose, with persevering ingenuity, with nice discrimination, with profound judgment, with generosity of spirit, with abounding health, and above all a reasonably tolerant attitude toward his fellow workers, which, however, should not leave him spineless and inclined to tread the paths of least resistance to detriment of himself and staff. In all kindness to an erring fellow worker, it is better to call him to account early, than to permit matters to proceed to an unfortunate state, where drastic correction is occasionally a distasteful and acute solution.

We will all agree, I believe, that many of our entomologists are inconsiderate of their health, failing to take the proper amount of regular exercise to maintain the dynamic force and brimming energy of body and mind which succeeds. We owe it to ourselves, our families and to our profession to take some form of regular exercise, preferably out-of-doors, and perhaps to reduce smoking when indulged to excess. Further, the aspiring entomologist should observe as far as is reasonable the habits and customs of well dressed people and maintain a presentable appearance on occasion. Let it not be said that entomologists compose any considerable part of "those queer scientists" in the common parlance, for there is not a single reason why an entomologist should not pass anywhere as far as appearances go for a successful business or profession-

al man. If we would place our profession where we would like to see it, we must mingle with our clients and the public, and in every legitimate way impress on them the importance of our profession and its achievements on the economics of world activities wherever applicable.

Has the entomologist been dilatory in his attitude toward allied fields of science and the earnest workers engaged in them? Has he been cognizant to the fullest degree of the tremendous advantages accruing from frequent contact with investigators and operators in any and all fields of human effort? Has he absorbed the enthusiasm of the salesman, the zeal of the merchant, the precise accuracy of the engineer, the tact and diplomacy of the stateman, and above all is he hopeful and courageous? Has he the conviction and belief in his own problems and efforts to the extent of demanding adequate financial support from the proper sources, or is he supinely accepting the crumbs dropped from the appropriation table after other branches of work have taken their portion? If you need something, go after it and persevere, for there exists a certain combination of audacity and calculation which assures success. Will he enforce quarantine laws and prosecute violators and wrongdoers? If one does not believe in his profession and have an abiding faith in it, it is better that he relinquish it and seek another business.

THE GOAL

By Burton Braley

Most men are drifting
And changing and shifting
In all that they plan and they do.
Their schemings are hazy,
Their purpose is lazy,
They have no objective in view.
But those who're successes
Are not fooling with guesses;
Such casual ways they abhor.
They know WHERE they're going
And WHY they are going,
And WHAT they are going for.

It's not that they're clever,
But all their endeavor
Of mind and of body and soul
Is wisely selected
And grimly directed
To reach to some definite goal.
They've laid out their forces
On well chosen courses

To win in Life's clamorous war
They know WHERE they're going
And WHY they are going,
And WHAT they are going for.

On history's pages
Down all of the ages
The names that are written in fire
Are those, who undaunted
KNEW JUST WHAT THEY WANTED
And never forgot their desire.
The lesson is there for
Your use if you care for
A place in the dominant corps
Know WHERE you're going
And WHY you are going
And WHAT you are going for.

The financial problems connected with entomology constitute an ever-increasing arduous duty, especially to heads of bureaus or divisions. Not alone are demands on the increase and costs of supplies and travel excessive, but the multiplicity of new problems arising from year to year are often causes of deep concern. In addition to these phases of finance, the question may be raised as to whether we are, by our efforts and the results obtained and information dispersed, justifying the expenditure of the large funds which are made available, and which would represent interest on vast sums. Are we measuring up adequately to some of those wonderful early workers, who accomplished much of lasting value from investigations at slight cost of operation? Should we not take stock occasionally and account for our stewardship?

Whither are we going in entomology? To what extent is the rapid development of the past 25 years, since 1897, when the writer took his first course in entomology, an index to future activity and an indication of future development? Should the same policies be continued in grouping of projects or will there appear the desirability of segregating more sharply the experimental and the control or police phases, and if so separated how shall they coordinate in order that results of research may benefit most advantageously? Shall we develop a certain type of entomologist narrowed down to research and another of different mentality and action to apply determined methods in control efforts?

Another great field of much promise is open to us which in its contacts with allied branches of agriculture and horticulture has been developed but slightly; viz. crop sanitation and crop rotation problems to be worked

out with the soil expert and the agronomist. Probably herein lies the greatest opportunity for cheap, valuable and reasonably constant pest control without serious interference with customary routine practice. The writer believes that preventive entomology, akin to preventive medicine, has an interesting development just ahead.

The remarkable results obtained in heat control and vacuum fumigation of insect infested goods opens up a tremendous new field, which would indicate the desirability of intermittent heat storage to replace cold storage for household goods, woolens, furs, carpets, grain and grain products, tobacco, lumber and similar dry merchandise. Who knows what recent experiments in dusting by airplane may lead to, even to the extent of gas treatment of immense acreages. The recent development of liquid cyanogen for fumigation; the highly successful paradichlorobenzene treatment for peach tree borers; the greatly belated development of casein and flour stickers; copper-arsenic dust for potatoes, and similar crops, and the rapid adoption of the alkaloid nicotine in liquid and with a dust carrier, are a few outstanding recent accomplishments of which we can be proud. Every young entomologist should have an attitude of assurance to believe that economic entomology is only in its morning hours and that he has a wonderful opportunity to aid in turning on the light to a more perfect day of accomplishment. Whereas but a few workers labored in earlier years and accomplished so much in a brief span of activity, should we not be buoyantly optimistic with high expectations when many workers shall have merged the impetus of their endeavors in entomology and closely allied subjects.

PAST PRESIDENT COOLEY: We have had the privilege of listening to a very thoughtful and interesting address.

We will now proceed with the discussion.

MR. WILMON NEWELL: It seems to me that we have received, in the President's address, some good food for thought. We can well afford, in the haste of carrying out our own plans and ideas and purposes, to occasionally pause and give thought to just such considerations as have been brought out in that excellent address. Perhaps most of us do not stop to think what next year and the year after, and the next ten years, may bring forth, either in our own lines of endeavor or the endeavors of our fellow workers in economic entomology. No one could have foreseen, a quarter of a century ago, what has actually happened in the last twenty-five years, and of course no one can foresee what will happen

in the next twenty-five or the next fifty, but we do know this—that the more difficult it is to sail a ship, the more keen are the lookouts, and we too, should be ever alert, watching for the opportunities to make our calling more useful, and to adapt it to the needs of the times, to respond to opportunities. I doubt whether economic entomology has always responded as quickly as it should, to changing conditions.

I have been very much impressed with what the President had to say about bringing our profession more into the minds of the public, of inspiring more respect for this thing that we call economic entomology and he has made a most valuable suggestion regarding the teaching of the primary sciences, including entomology, in the public schools. We all know how much easier it is to instill knowledge and respect for any subject in the minds of the children than it is to instill it into the minds of older people; and even though we smiled when he mentioned the personal appearance and habits of entomologists, it is nevertheless true that the great bulk of people form their opinions of a profession by the people in that profession with whom they come in contact. I think we can well read and reread that excellent address!

MR. C. L. MARLATT: I wish to give my very hearty endorsement to the address. I think some of the points that made us smile are very useful points. The standing of any group of men in a community, or in the world, is in part based on their own standing with themselves. Your work should warrant self-respect, a feeling that you are engaged in something worth while, and that you are not ashamed of it, and you should live up to that feeling. I think the public takes you very largely on the measure that you give yourself, and the entomologists ought to keep that in mind.

I think we are a rather gentlemanly looking lot of men as I look over the audience. I see no long-haired men in the group, although quite a few have whiskers! (I am not looking at Dr. Howard or Dr. Felt) But there is much benefit to be had from having a reasonably good opinion of ourselves, as good an opinion as the Chairman, our President, undoubtedly has of himself—and quite properly.

As to the public's appreciation of the work of entomologists, I am not in disagreement with our President, but I feel perhaps he has underestimated the appreciation of the public of the work in economic entomology. I think we have passed through the period of being unknown and sometimes unrespected. I believe the work of economic entomologists is now pretty well known and its value appreciated. In the lines of work in which I have been more particularly interested during the

last few years, in plant protection and plant quarantine, I have discovered that the knowledge and appreciation of that work is almost universal.

Acting in my peculiar capacity as buffer for all the kicks that come in, I have come across a great many people whose feelings had been hurt, but I have yet to come across a single person who has not expressed at least the realization of the need of protection from plant enemies. It is practically universal. Nearly every woman and man of the country has some appreciation of that need.

This does not mean that we are known as well as we ought to be known, but I do feel we stand well in the minds of the people of the country. If we can strengthen that status by our own attitude, our own reasonable and proper self-pride, I think it may help matters a great deal.

PAST PRESIDENT COOLEY: I am aware that we like to think over an address at some length before we commit ourselves to words. I admire the courage of the speaker in departing from stated facts and imparted knowledge and looking forward. He has stimulated thought. An entomologist should not dwell too long in the field of imagination, yet he needs some imagination to make him progress. I feel that the President's address has been very stimulating in that it directs us to look forward.

President Sanders resumed the chair.

PRESIDENT J. G. SANDERS: The first paper on our program is "Problems in Economic Entomology," by E. P. Felt.

PROBLEMS IN ECONOMIC ENTOMOLOGY

By E. P. FELT, *Albany, N. Y.*

ABSTRACT

The annual cost of plant quarantines for the various States is one and a half million dollars; for twenty-eight Californian Counties nearly ½ of a million dollars; for the Federal Quarantine Service $185,310.00 and in addition one and a half million dollars for the control of regional pests. Costs might be reduced by the adoption of a plan which would obviate reinspection. Quarantines are human and eradication of recently established insects, such as the camphor scale, *Pseudaonidia duplex*, would be a logical sequence.

The Gipsy Moth, *Porthetria dispar* is now established along approximately seventy-five miles of the eastern border of New York State. A barrier zone extending northward and westward through the highly cultivated regions from Bridgeport to Danbury, Connecticut, thence through portions of the Harlem, Hudson, Champlain, and St. Lawrence Valleys to Lake Ontario, is recommended. Projects of this character should be under the direction of experts.

Conditions at the present time are very different from those of twenty-

five years ago. At this earlier period there were a few standard insecticides which were somewhat generally recommended and if the results were not satisfactory, it was an unfortunate condition which might be remedied in the future. There had not been at that time many exhaustive studies so characteristic of the investigations of the past twenty years, and advances in relation to insecticides were largely the result of incidental work in connection with other problems, as for example the development of arsenate of lead in the Gipsy Moth control work. Large expenditures by the Federal Government for quarantine and for the control of serious regional pests were in the future.

Early in the calendar year Professor C. R. Crosby of Cornell University obtained the cost of the inspection and quarantine services of many of the States and has kindly allowed the writer to use these data. It has been found that the State officials of this country are expending over one and one half million dollars annually and officials of 28 Californian Counties nearly one third of a million dollars annually in this work. These figures do not include the cost of the Federal quarantine service, $185,310.00, nor comprehend in more than a very limited degree, the large sums, totaling over $1,500,000.00 appropriated by the general Government for the control of serious regional pests and allied purposes. Furthermore, in the western States, particularly California, large sums are spent for weed and rodent control or eradication and the standardization of fruits. These latter in a broad sense might be classed as expenditures for inspection and quarantine, though they are not so considered in this paper.

These are vast sums and one may reasonably inquire as to the results which have accrued from the expenditures. There is no question but what there has been a marked raising of Horticultural standards and that under present conditions, it is very difficult to sell trees badly infested with a number of dangerously injurious insects or infected by certain plant diseases. Furthermore, the higher standard for fruits, both in the east as well as in the west, have bettered conditions and made satisfactory returns more probable. The same considerations apply in a general way at least to importations from other countries.

It must be admitted that quarantines are human and in the long run some pests escape inspectors in spite of repeated examinations. It may be possible to improve the inspection service even if there be no other gain than a reduction in cost without affecting the degree of protection. It is well known, for example, that nursery stock is inspected at the point of origin in some States, and reinspected at destination

and in some States, such as New York, recognition of interstate law has resulted in these inspections being made at the point of destination. This means large costs inevitable with the inspection of small and widely scattered lots. Is it possible to standardize methods of inspection in the various States so that duplications of this character can be avoided? One thorough inspection should be enough and it might be possible to develop and attach to each tree a seal which could not be tampered with and would therefore be accepted throughout the usual distributional areas and if this were admitted, it might be advisable to divide the country into sections where similar stock is in general demand. Cases not readily covered in this manner could be handled about as at present.

EXPENDITURES BY STATE OFFICIALS FOR INSPECTION AND QUARANTINE IN 1921 OR 1921–1922

State	Salaries	Other Expenses	Apiary	Corn Borer	Gipsy Moth	Total
Alabama	4898.60	3376.65				8275.25
Arizona	20000.00	30000.00				50000.00
Arkansas	7280.00	3720.00				11000.00
California	40000.00	10000.00				50000.00
Colorado	in other expenses	20000.00	2500.00			22500.00
Connecticut	3549.61	4874.92	1981.70		35188.50[1]	45594.73
Delaware						
Florida	100000.00	8500.00				108500.00
Georgia	3000.00	60000.00				63000.00
Idaho	7400.00	27600.00				35000.00
Illinois	10000.00	14895.00				24895.00
Indiana	9101.90	5618.46	8372.15			23092.51
Iowa	3164.00	1887.23				5051.23
Kansas	1000.00		3000.00			4000.00
Kentucky		499.51				499.51
Louisiana	Practically no expenses					
Maine	1500.00				28500.00[1]	30000.00
Maryland	5560.00	4800.00				10360.00
Massachusetts	13000.00	10000.00			181957.92[1]	204957.92
Michigan						12000.00
Minnesota	3330.00	2220.00				5550.00
Mississippi	100000.00	67000.00				167000.00[2]
Missouri	1875.00	1875.00				3750.00
Montana	10800.00	26153.85				36953.85
Nebraska	No appropriation					
Nevada		500.00				500.00
New Hampshire	3600.00	8900.00				12500.00
New Jersey	13527.86	5721.35			5553.28	24802.49
New Mexico	No expenses, no appropriation					
New York	50000.00	50000.00		12500.00		112500.00
North Carolina	2000.00	700.00				2700.00
North Dakota	Little expense, no special appropriation					
Ohio	14200.00	10800.00				25000.00

[1]Includes control work.

[2]Includes $22,000 of Federal funds used for citrus, canker and sweet potato weevil eradications.

State	Salaries	Other Expenses	Apiary	Corn Borer	Gipsy Moth	Total
Oklahoma	3600.00	1500.00				5100.00
Oregon	2400.00	3600.00				6000.00
Pennsylvania	41850.00	23250.00	5750.00	1500.00		72350.00
Rhode Island	200.00	75.00				275.00
South Carolina	7500.00	2500.00				10000.00
South Dakota	1200.00	1300.00				2500.00
Tennessee	16900.00	15900.00				32800.00
Texas	17206.96	15666.46				32873.42
Utah	3420.00	8930.00[2]				12350.00[2]
Vermont	2000.00	2672.90				4672.90
Virginia	12309.91	6190.90				18500.81
Washington	24000.00	9000.00				33000.00
Wisconsin	8750.00	8750.00	10500.00			28000.00
Wyoming	No appropriation					
Totals	570123.84	478977.23	32103.85	14000.00		1358404.62[4]
Gipsy Moth total						251199.70[4]

[1]Apparently includes compensation of county crop pest inspectors.
[4]These totals should be increased by $125,000 each, the special appropriation in New Jersey for Gipsy Moth control and not included above.

EXPENDITURES BY CALIFORNIA COUNTY OFFICIALS FOR INSPECTION AND QUARANTINE IN 1921 OR 1921–1922

Name of County	Salaries	Other Expenses	Total
Contra Costa	$1800.00	$3700.00	$5500.00
El Dorado	1370.00	740.00	2110.00
Fresno			9000.00
Glenn	4733.75	2357.06	7090.81
Humboldt	2400.00	1200.00	3600.00
Imperial	4554.00	2214.02	6768.02
Inyo	1869.00	2150.00	4019.00
Kern	5402.50	1080.70	6483.20
Kings	2160.96	446.73	2607.69
Lake	1074.00	678.46	1752.46
Los Angeles	67864.81	17417.29	85282.10[1]
Madera	3298.25	1741.19	5039.44
San Rafael	1854.00	497.57	2351.57
Napa	2400.00	1263.10	3663.10
Nevada	2200.00	768.31	2968.31
Placer	4834.00	1452.82	6286.82
Riverside	10750.00	10750.00	21500.00
San Benito	850.00	225.00	1075.00
San Diego	13116.74	690.77	13807.51
San Francisco	4200.00	1680.00	5880.00
San Luis Obispo	625.00	600.00	1225.00
San Mateo	4000.00	1000.00	5000.00
Santa Cruz	2400.00	600.00	3000.00
Shasta	1200.00	1000.00	2200.00
Sonoma	4882.03	2034.09	6916.12
Stanilaus	18605.63	18102.20	36707.83[2]
Tulare	38284.93	18757.60	57042.53
Tuolumne	1000.00	1000.00	2000.00
	$207729.60	$94146.91	$310876.51

[1]A portion of this apparently should be charged to rodent control.
[2]Apparently about 50% of these amounts are for rodent and noxious weed control.

The above outline of expenditures by County officials is limited mostly to the expenses of inspection and quarantine, though in some instances an appreciable proportion of the cost of rodent control and other activities is included. The County Horticultural Commissioners of California expend considerable sums in standardization of fruits and vegetables, weed control and rodent control, matters receiving little attention in the eastern States, though as germane to the work as Gipsy Moth, European Corn Borer or citrus canker control in the east.

It will be noted that data have been obtained from 29 of the 51 Counties reported as maintaining Horticultural Inspectors who have the direction of approximately two hundred County Inspectors.

The Horticultural work of the State of Colorado is carried on in cooperation with County Pest Inspectors who are employed and whose expenses are paid by the several Counties in which the work is done. The amount expended by these County officials has not been ascertained on account of the difficulty of obtaining the data.

Reference has been made to the fact that quarantines are not perfect and in this connection we would suggest the desirability of methods which would result in the early detection and extermination, if advisable, of insects which have escaped the vigilance of quarantine officials. One of the practical difficulties with such a proposal is the impossibility of being certain that the recently established insect will prove sufficiently destructive in the environment to warrant the costly measures necessary for extermination. It would seem as though the recently established camphor scale, *Pseudaonidia duplex* Ckll., in view of the history of the San Jose scale in America, might be classed as one of those pests which should be exterminated.

We have at the present a similar, though somewhat different problem, pressing for solution in the northeastern United States. I refer to the presence of the Gipsy Moth along approximately 75 miles of the eastern boundary of New York State and to its threatened spread over a large area if matters are allowed to follow the course of the last few years. There is no denying the fact that the Gipsy Moth is a serious enemy of forests in the temperate regions of this country and if the spread of this insect is allowed to continue, it is only a question of time before the border of the infested area becomes so extensive as to make it nearly impossible to check further spread.

Can we afford, as Entomologists conversant with the situation, to allow matters to drift in view of the fact that the possibility of exterminating this insect in remote infestations and under distinctly adverse

conditions has been demonstrated time and time and again and in consideration of the fact that those best acquainted with the pest do not hesitate to state that it is clearly practicable to prevent further spread? The border of the infested area is now stretching toward a highly cultivated region with a minimum of rough, forested ground and in view of such unusually favorable conditions for checking spread existing from Long Island Sound northward from Bridgeport, Connecticut to Danbury, thence to the Harlem Valley in New York State and northward and westward through the Hudson and Champlain Valleys and thence westward along the New York border to Lake Ontario, we would seriously suggest the advisability of actually preventing further spread beyond some such line, because such limitations would mean freedom for at least a series of years for all territory to the west. In other words, this means the application of exterminative measures to a strip instead of to a circumscribed area.

We would also call attention to the fact that the total expenditures in Massachusetts in 1921 for control of the Gipsy Moth in the then infested area, probably less than three-fourths of the total area of the State, amount to the tremendous sum of $836,108.40 according to figures compiled under the direction of the Massachusetts State Forester, William A. L. Bazeley and kindly placed at our disposal. Should the entire State of New York become infested and the same ratio prevail, the annual cost for suppressive work in the State would exceed five and one-quarter million dollars. It should also be noted that in 1897 and again in 1899 the late Professor C. H. Fernald, then Consulting Entomologist of the Massachusetts State Board of Agriculture, which latter was then in charge of the Gipsy Moth work, estimated the cost of exterminating the Gipsy Moth at $1,575,000.00, the work to be continued over a period of fifteen years.

Briefly, this was an estimate which had the approval of experts engaged in the work, the men by all means best qualified to pass upon the situation. The project was allowed to lapse, the opinion of experts was set to one side and as a consequence the total cost to all agencies in the infested portions of the State of Massachusetts, comprising far from the entire area, amounted in 1921 to more than half the total estimated cost of extermination in 1897 and that for what was really unsatisfactory control. As a further consequence the State of New York is threatened with heavy annual expenditures because of an insect which could have been exterminated and should not have been allowed to escape.

The setting of the opinion of experts to one side is a grave phase of the situation. Our Entomology is economic only in proportion as it is carried out. It is comparatively easy to start a program of extermination and this was done in Massachusetts in 1891. The weak point came with the development of the work to such an extent that little was to be seen of the insect and a popular verdict was given against continuance of operations.

There has been, as intimated above, a vast increase in our knowledge of insects and methods of controlling them during the past twenty-five years. It may reasonably be claimed that American Entomologists are a group of experts best qualified to pass upon insect problems. The speaker is of the opinion that whenever a representative group of qualified Entomologists agree upon a policy, such policy should receive the support of executives, unless said executives are willing to accept the responsibility for inaction or modification. The great metropolitan water system of Massachusetts and the huge water supply projects of New York City were all planned and directed by engineers,—men pre-eminent in the branches of science relative to such matters and in making the above statements, the writer is simply emphasizing the need of similar action in relation to Entomologists if the country is to secure the full benefit of their services.

PRESIDENT J. G. SANDERS: Is there any discussion?

MR. W. C. O'KANE: I only wish that Dr. Felt had taken more time and had gone further. He has begun a discussion of an important problem. We have had this subject before us incidentally at the last two or three meetings—this subject of what we might call "entomological engineering." Personally, I am convinced that it is a wide and important field and I am inclined to think that in spite of all of our needs for research, in spite of its importance and its fundamental value, there is an almost equal need for the kind of undertaking that he has mentioned.

PRESIDENT J. G. SANDERS: The next paper is "Choice of Food and Numerical Abundance Among Insects," by C. T. Brues.

CHOICE OF FOOD AND NUMERICAL ABUNDANCE AMONG INSECTS

By CHARLES T. BRUES

ABSTRACT

Insects are not alone in almost unlimited capabilities for rapid multiplication, the limiting causes being prevalence of disease, parasites and available food supply. The remarkable instincts associated with the choice of food plants have been largely neglected by investigators. Certain insects like the migratory locusts are highly polyphagous, while others are limited to a single food plant, probably through a long evolutionary process. Agricultural pests may be either polyphagous, oligophagous or monophagous and under primitive conditions the former were represented by larger populations than those with more restricted diets. Only very exceptionally do natural associations of plants offer ideal conditions for monophagous insects, as in western coniferous forests and certain types of grasslands some oligophagous species are apparently composed of several phytophagic races propagating more or less independently. Species exhibiting remarkable capacity for shifting from one food plant to another, such as the cotton boll worm may become extremely abundant where its food plants are associated, though natural checks soon establish an approximate balance as a rule. Trees and plants with a long life cycle occupy a relatively insecure position with regard to insect damage.

In their almost unlimited capabilities for rapid multiplication, insects do not stand alone among animals, although the economic entomologists may sometimes be tempted to categorize them thus. That many insects frequently approach more nearly the mathematical possibilities in their actual population growth than do the vertebrates or even the more conspicuous other invertebrates is, nevertheless, quite true, and the main contributing causes for this are naturally familiar to the entomologist who is periodically confonted by outbreaks of noxious insects.

That we may not become too pessimistic concerning the abundance of insects, several entomologists have been guilty of counting the prospective progeny of a happily married and economically independent pair of insects, able to protect and provide for their descendants during a single season. No less an authority than our fellow member Dr. Howard assures us that an April bride of our common housefly under such ideal conditions would not be able in the autumn to enumerate her great grandchildren of the fifth generation with less than 13 figures. He further concludes that a really prolific strain of houseflies might produce a far more extensive family. At that time it did not occur to him that even the smaller family, dried and pressed into briquettes, would furnish nearly 20,000 tons of a very good substitute for coal, all the product of the insignificant fly born at the season of the year when the provident members of human society were filling their cellars with anthracite.

It is of course patent that the numerical abundance of a great many species of insects, perhaps of nearly all, depends to a very limited extent upon their powers of reproduction and almost entirely upon the factors which tend to limit these powers. Among these, the prevalence of disease, of insect parasites and the extent of the available food-supply are the factors that determine how far any species may utilize its latent powers for reproduction and multiplication. All three factors are highly variable and to one or the several in combination may usually be traced the numerical abundance of any particular species. Entomologists have devoted so much effort toward elucidating the relation between host and parasite and the balance between insect and food-plant, that a detailed knowledge of such facts is generally recognized as a fundamental prerequisite for the formulation of control measures directed against agricultural pests.

In spite of its basic importance in determining the economic status of phytophagous insects, the remarkable instincts associated with the choice of food-plants have been largely neglected as a field for investigation by economic entomologists, due, no doubt, to the pressing demand for information of more immediate application.

We know for example, among economic insects of importance that some like the various migratory locusts are so highly polyphagous that they balk at practically no type of green food (even paris green and molasses), while others like the cotton-boll weevil not only refuse, but seem actually unable to subsist upon any but a single food plant. These two extreme cases suggest that primitive omnivorous insects may have become specialized through a long evolutionary process and have produced among the higher orders first species with restricted diet and finally ones of strictly monophagous habits. Such an assumption is, in a very broad way, probably correct, but it does not take into account the intimate mixture of polyphagous, oligophagous and monophagous species to be found in almost any phytophagous division of the higher orders of insects. The familiar large Saturniid moths furnish a concrete example: the caterpillars of the Cecropia moth are credited with sixty-odd food plants, some of course more favored than others, while those of the closely related Ailanthus moth are restricted to the ill-smelling foliage of the Tree of Heaven, and the Eri silk moth selects almost exclusively the leaves of the castor oil plant. What the reason for such divergencies may be, or whether the Eri caterpillar like the Kansas grasshopper would prefer its castor oil with orange juice, I shall not attempt to predict in the absence of the proper experimental data, but I wish to

call attention to some facts relating to the numerical abundance of some other insects of the several types just mentioned.

It is evident after a moment's consideration, that destructive agricultural pests, or in other words, numerically abundant species that feed upon useful plants, may be either polyphagous, oligophagous, or monophagous. Under natural conditions as they existed before agriculture changed the face of nature, there can be little question that insect species of polyphagous tastes were represented by larger populations than those affecting more restricted diets for it is only under very exceptional conditions that natural associations of plants are sufficiently dominated by a single species of plant to offer ideal conditions for the multiplication of monophagous insects. Such notable exceptions are illustrated by some of our western coniferous forests and by certain types of Savannahs or grass-lands where the dominance of one or of several species is almost complete, more nearly so indeed than in the average potato patch. To natural associations of plants, common migratory locusts are about as destructive as to cultivated areas. The non-migratory forms we cannot legitimately compare in this connection on account of the destructive action caused by plows and harrows to their eggs in cultivated fields.

Under natural conditions oligophagous species sometimes enjoy the presence of their several food-plants in close proximity over more or less extensive areas, but much more commonly they do not, for it is by no means the rule to find the several food plants of such species occurring in the same associations of plants. Rather does it appear that at least many oligophagous insect species are composed of several phytophagic races as Walsh termed them many years ago. In reference to the species as a whole these races appear to bear a relation analagous to the pure and impure species of the genecticist and in many cases at least the phytophagic races propagate themselves more or less independently of one another. Races of this sort are exemplified by the apple-maggot and blueberry-maggot (*Rhagoletis pomonella*), the codling moth of the apple and of the walnut (*Cydia pomonella*), the mangold-fly (*Pegomyia*) and others. Such species, so far as numerical abundance is concerned, do not appear to profit by their ability to feed on more than one food-plant as they do not shift readily from one to another. On the other hand, at least one of our very important economic insects has been able to capitalize its fondness for several agricultural plants. This is the cotton bollworm, an insect which has become numerically abundant under the agricultural conditions now prevailing in our southern states. As

is well known to every one present, the larvæ of this moth have two very favored food-plants, maize and cotton, several less favored ones such as tomato and tobacco and a number of others to which they will quite readily transfer their attention with practically no persuasion. Maize is undoubtedly the most favored food, but no strains have been developed preferring maize or cotton respectively and this is undoubtedly due to the seasonal distribution of the parts of the plants attacked, namely the unexpanded tassels and soft ears of maize and the buds and green bolls of cotton which follow one another during the growing season and offer a continuous but changing food-supply not only to the several broods each summer, but regularly from year to year.

Species exhibiting such plasticity in their behavior tend to become extremely abundant where their several food-plants are associated, and the species just cited has been favored by an unusually happy combination of circumstances. If we apply such a principle to another insect like the cabbage maggot (*Pegomyia*) it is evident that this species should be able in the ordinary truck garden where cabbages and a succession of radishes are grown, to avail itself of a continuous supply of succulent food. In connection with this species, I am not aware, however, that any investigations have been made to ascertain how readily the flies shift from one food-plant to another in successive generations, and the studies of the English entomologist Cameron on related species suggest that the cabbage maggot may have phytophagic varieties or strains, which tend to remain from generation to generation on the same food-plant. So far as oligophagous forms are concerned, it is evident that aside from the mere existence of several acceptable food-plants, the numerical abundance of each species is influenced not only by the proximity of the several food-plants, but by the ease with which a shift is made from one favored food-plant to another; and furthermore that all insects do not react similarly when the opportunity for a change of food-plants is presented to them.

The Oligophagous habit passes by close intergrades to the monophagous type of feeding. Frequently the difference is only apparent and due to incomplete knowledge as has been often demonstrated. Again it is easily conceivable that the areas occupied by the several food-plants may be separated geographically, in which case the strains feeding on one plant will never have opportunity to pass to another and may become so wedded to this food that they will refuse to leave it. On the other hand as is well known from the behavior of certain introduced insects a sudden taste may be shown for a strange, though usually

closely related plant. Some recent experiments of my own with the Colorado potato beetle show this type of behavior very clearly. This insect will feed upon various species of Solanum belonging to two of the five sections into which the genus is divided; at least several of the species referred to the section that includes the original food-plant (*S. rostratum*) are readily accepted, as well as our common bittersweet (*S. dulcamara*) which falls in another section, that to which the potato belongs. The bittersweet and a large spiny African plant (*S. marginatum*) attract the beetles even when planted in close proximity to the potato. The ordinarily monophagous habit of the potato-beetle is thus clearly due to the composition of the flora and any significant change in the latter must have its effect upon the numerical abundance of the beetles, particularly on the population living at the expense of its economic food-plant the potato, which is planted from year to year without reference to the abundance of the beetle, while the supply of its uncultivated food-plants varies inversely with the prevalence of beetles.

Just as the supply of the food-plant necessarily limits the abundance of the insects dependent upon it, so the number of insects competing for subsistence upon a single kind of plant influence one another greatly. Such competition does not however, lead to such a strict "survival of the fittest" and "elimination of the unfit" as theoretical considerations might lead us to believe. Several entomologists who have during recent years compiled lists of the insect faunæ of dominant species or genera of plants under both natural and agricultural conditions, have been able to find long series of insects affecting almost any plant which they care to investigate. In more or less circumscribed areas these series of insects come into direct competition with one another when they depend upon the same part of the plant, such as the foliage, although indirectly all interfere with one another; even such diverse kinds as Aphids, defoliators, leaf-miners, stem and root-borers, etc. Under prevailing non-agricultural conditions, this competition is so much less keen than that between host and parasite that a phytophagous insect appears rarely or never to be actually threatened with extinction or even decimation by any failure of the food supply resulting from the ravages of competing species. It must be understood fully however, that I should by no means wish to imply that such competition extending over long periods of time might not readily lead to vast changes in both fauna and flora. Just as an extensive outbreak of some phytophagous insect like the American tent-caterpillar with its accompanying epidemic of parasites and other enemies may lead to the complete local ex-

tinction of the host, so might an insect become numerically so abundant as to annihilate its food-plant. Before the latter contingency threatens, however, the background of entomophagous parasites comes to the fore and saves the day for the plants.

Trees and other vegetation of slow growth, where the developmental cycle extends over a period of years, occupy a more insecure position than their annual or biennial relatives, and are unable to take the same advantage of any temporary reduction in the ranks of their insect enemies. Nevertheless here too, the quick response of parasites to an increased abundance of their phytophagous hosts ordinarily effects a readjustment in numerical abundance before an extensive depletion of food-plants takes place. Thus, in France Clement finds 450 insect enemies of the willows and Coulon 1,400 species affecting oaks, all so regulated by parasites that they do not crowd out one another, nor do they eliminate their food-plants during the twenty-odd years required for the individual oaks to attain sexual maturity.

Excessive outbreaks of forest pests, however, do occur; witness the larch sawfly, spruce budworm and the Gipsy moth in their native habitats, resulting in a prolonged depletion of food-plants over wide areas.

One of our lessons of early childhood attempted to teach us that "we cannot eat our cake and have it too." This was necessarily impressed upon us by firm parental persuasion. A wider biological application of this adage must introduce the term "parasitic persuasion" to designate the Spartan method adopted by Nature to conserve the cake.

PRESIDENT J. G. SANDERS: We will now have a paper by Mr. A. G. Ruggles and S. A. Graham, entitled "The Obligation that Economic Entomology owes to Forestry."

THE OBLIGATION THAT ECONOMIC ENTOMOLOGY OWES TO FORESTRY[1]

By S. A. GRAHAM AND A. G. RUGGLES, *Division of Entomology, University Farm, St. Paul, Minn.*

ABSTRACT

Forest Entomology has been neglected as compared with insects affecting other crops, despite the enormous losses in our important forest areas. The entomologist has inclined to the belief that forest insects can not be controlled and the forester has

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usually received more or less impractical advice. The spruce bud worm, the forest tent caterpillar and the larch sawfly are major insect problems as well as the control of pests attacking freshly cut timber, particularly pulp wood. The general effects of poisoning forest areas should be investigated. The method presumably can be used only to a limited extent. A study of ecological relations and the development of improved silvicultural methods is advised.

All of us who are working in the various phases of entomology recognize that economic entomology exists for the express purpose of organizing and directing man's fight against his insect enemies. It is apparent to anyone acquainted with agricultural conditions that if it were not for the efforts of the economic entomologist in devising and applying measures for the control of injurious pests, the chance of success for agricultural operations would be even more uncertain than at present. We must, of course, admit that there are still many uncontrollable insect pests, but when we consider the large number of species that can be sucessfully controlled we should feel decidedly encouraged.

Results always speak for themselves! Therefore no one can doubt that the entomologist is using every means in his power to solve the problems of both the farmer and the horticulturist. His efforts along this line have been rewarded with success; remarkable success when the odds against which he is fighting are taken into consideration. A large proportion of our extremely serious farm and orchard insects can be more or less satisfactorily controlled. In this connection we think of such outstanding entomological successes as the control of the Hessian fly by a slight change in time of planting, the development of arsenical poisons for the control of the Colorado potato beetle, of the use of lime sulphur and miscible oils for the San Jose scale, the development of poisoned baits for grasshoppers and cutworms, the power sprayer which made possible a satisfactory attack on the codling moth, the high power sprayer combined with special nozzles for protecting our town and park trees from the ravages of such unwelcome guests as the gipsy moth and the elm leaf beetle. And so we might go on enumerating milestone after milestone in our rapid advance in the control of farm and horticultural insects.

But the entomologist is not yet satisfied. He continues to bend his efforts toward the improvement of control measures and toward the discovery and application of means for checking the ravages of those insects which cannot be controlled at present. Think of the time and energy that some of our best minds are devoting to the gipsy moth, the European corn borer, the Japanese beetle, and the Mexican bean weevil problems. Without question such efforts must be rewarded.

But have we not been neglecting one field of economic entomology that is surely deserving of more consideration than it has received? That is the field of forest entomology. A handful of men have given their lives to this phase of insect work but their numbers have been so few and the problems with which they were confronted have been so tremendous that they are only now just beginning to make real progress. Most of the so called forest entomological work has not been conducted by economic entomologists interested primarily in forest problems, but by a group of men whose primary interest lay in other directions. These men for one reason or another were led to take up forest entomology as a side issue. Very naturally their work has been largely along the lines of taxonomy and life histories and they have made valuable contributions to these phases of the subject. Unfortunately, these workers set the fashion for forest entomology workers. Under such conditions is it any wonder that so few forest insects can be controlled? The farmer and the horticulturist have their insect insurance in the form of effective and economical protection methods, but the forester in spite of his dire need is left to gamble with fate and take his chances with insect pests of which he knows little or nothing.

The destruction of trees does not seem to disturb many entomologists. As a rule they are able to look with placid equanimity upon the wholesale destruction of vast forests. Losses which would have awakened the whole country to action, had they been in farm crops have been passed almost unnoticed. What forest insect has ever created half the excitement among entomologists as has the recently introduced pest, the European Corn Borer? If the gipsy moth had been primarily a forest insect would there now be a gipsy moth laboratory?

Were economic entomologists much disturbed when the outbreak of the larch sawfly destroyed over 60 percent of the merchantable tamarack in the vast area extending from Minnesota eastward to the Atlantic coast? A few entomologists made a good beginning in the study of the problem but we are still in no better position to control or prevent the next outbreak, which is sure to come, than we were in 1905. From estimates in Minnesota it appears that in this state alone the larch sawfly killed tamarack equivalent to over 1,000,000,000 ft. board measure, and almost 50,000,000 posts, poles and ties. At present stumpage rates this represents a cash loss of approximately $5,000,000.00 for the state of Minnesota. The loss in the entire range of the eastern larch can only be a matter of conjecture but doubtless it totals many millions of dollars. Considering the vast extent of the range of this

tree and considering the fact that the sawfly outbreak extended throughout this entire region, we are forced to concede a total loss amounting to at least $100,000,000.00.

The present outbreak of the spruce budworm in eastern Canada, Northern New England, and Minnesota has destroyed an almost unbelievable amount of timber. Before this outbreak has subsided the loss for the whole infested area will doubtless amount to at least 200,000,000 cords of standing woodpulp. This amount of wood, piled in cords with the end of each cord touching the next, would extend more than five times around the earth. At an average stumpage price of $1.00 per cord, which is doubtless too conservative a figure, the loss due to the budworm will equal $200,000,000.00. In Canada the Entomological Branch of the Department of Agriculture has devoted much effort to the study of this insect, but what have we done in this country?

During the two decades from 1905 to 1925 the loss in forest products resulting from these two outbreaks, the sawfly and the budworm, will amount to a combined total of at least $300,000,000.00 or an annual loss of $15,000,000.00. The history of forest entomology in this country has been marked by a series of outbreaks. One after another pests have become epidemic and the epidemics have waned. To the losses from epidemics we must add the normal annual loss occasioned by the hundreds of pests whose injury may be less conspicuous but none the less real. The basis upon which this loss is usually estimated is 10 percent of the total value of all forest products. According to the 1920 census figures, which are the latest figures available, the total value of forest products in 1919 was $2,420,000,000.00. Ten percent of this amount is $242,000,000.00. In Minnesota alone during 1919 the loss due to forest insects including budworm losses totalled at least $7,500,000.00. Is it right that we should shut our eyes to these losses? Should we not devote our energies to solving the forester's problems as well as those of the farmer and the horticulturist. Do we not in our position as entomologists owe just as much to forestry as we do to other branches of agriculture? Some may point to funds which have been expended for the study of forest insects and say that entomology is fulfilling its obligation to forestry, but where are the results?

THE ATTITUDE OF THE ENTOMOLOGIST TOWARD FOREST INSECT PROBLEMS

The attitude of the entomologist toward the forest insect problems which he has been called upon to solve has had much to do with bringing about the unfortunate condition in which forest entomology finds itself

today. For years the entomologist has attacked forest insect problems with the well established conviction that insect control under present forest conditions is practically impossible. He does not really expect to control forest insects until such time as forest trees in America are as carefully cared for as they are in the most highly developed European forests. His work with farm and horticultural insects has led him to exaggerate the place of our mechanical means of insect control and if spraying or some other such method cannot be applied he is prone to say in a most hopeless tone "then what can we do?". We are all equally culpable.

ATTITUDE OF THE FORESTER TOWARD ENTOMOLOGY

Is there any wonder that the forester looks askance at entomology. He has come to think that the entomologist is either unable to help him or else is uninterested. He finds that most of the suggestions which the entomologist gives him are impractical. It is natural that he should conclude that to call upon such a source for help is useless. Forestry has no constructive plan for the protection of forests from insect attacks, not because it is not sadly needed, but because the entomologist has usually been unable to make any practical suggestions for such a plan. Therefore the forester calls on the entomologist for help only after all other means have failed.

The entomologist then answers the call and investigates the situation, but what does the forester get. He gets a report. Sometimes a voluminous piece of literature with figures, plates, and tables. The content of these reports has become so well established that one can almost unfailingly predict its general character. It will start out with a discussion of the importance of the outbreak, and perhaps a little historical data regarding the insect in question. Then follows descriptions of the various stages with figures, preferably colored. Next comes the life history in detail in which the most personal affairs of the insect are disclosed and finally comes a section headed control.

Under control there will be something like this. "Unfortunately under our present forest conditions it is impossible to control this pest. If sometime in the future economic conditions so improve that we can expect a much larger return per acre from our forests and can therefore spend much larger amounts in cultural practices we may be able to suggest something that the forester can afford to try. At present we are forced to let things take their course much as it pains us to do so." *The very thing that the forester needed most the entomologist did not give him.*

PROBLEMS IN FOREST ENTOMOLOGY WHICH SHOULD BE SOLVED

In the United States as a whole there are hundreds of forest entomo-

logical problems crying to be solved. The scope of the present paper will only permit us to mention a few that are of particular importance in Minnesota. The most outstanding of these is the problem of protecting our balsam and spruce forests from outbreaks of the spruce budworm.

The outbreak in Minnesota has already involved the greater portion of our balsam spruce forests and it is practically certain that the small uninfested area in the northeastern tip of the state will be infested in 1923. A very large proportion of the balsam in at least two-thirds of this area is already dead. There is every indication, that under present conditions we may expect repeated outbreaks of the budworm every thirty to fifty years. Is there not something that we can do to prevent recurring epidemics of this insect or if that is not possible can we not at least find some way of reducing the amount of damage?

Another defoliating insect which seems to be of increasing importance in this state is the forest tent caterpillar. Recently there have been several rather extensive local outbreaks of this pest. Although they have not reached proportions comparable with that of the spruce budworm they are nevertheless important. The ever increasing amount of birch and aspen forest is apparently a factor in aiding the rapid increase of the tent caterpillar. It is very probable that this insect will be from year to year increasingly important in our forest economy.

The larch sawfly although the epidemic is decidedly on the wane, is still a menace to be reckoned with. Tamarack on well drained soil grows very rapidly and in such situations promises quick returns when grown for posts and poles on a short rotation. The planting of this very desirable species cannot at present be recommended because of the possible danger of sawfly attack. The sawfly question is still a very fertile field for investigation, and it certainly does not present any greater difficulties than many of the problems already solved by entomology.

One of the very live issues in forest insect work is the control of pests in freshly cut timber, particularly pulpwood. Much of this material is always held over a season for one reason or another and, if it cannot be placed in water, the losses due to borers is very material. It has been stated that the usual depreciation in a pile of pulpwood held over one season amounts on the average to 10 percent of its value. This means a depreciation of about one dollar a cord. We are now working on this question and hope to have soon a practical method of materially reducing these losses.

METHODS OF ATTACKING THE FOREST ENTOMOLOGICAL PROBLEM

The difficulty of a problem in forest entomology is directly proportional to the distance between the wood or tree and the finished product. We can afford to spend more in protecting material at the mill than could be spent on the same material in the woods. We can spend more on cut timber than on standing timber. The nearer a tree approaches commercial maturity the greater its value and the more we can put into its protection. During their early years the trees must practically be left to take care of themselves, since a good profit on the final crop can be wiped out easily by compounding interest even on small injudicious expenditures in the early years of the rotation. When these facts are considered it appears probable that insect problems connected with forest products are likely to be the simplest whereas those connected with young trees are likely to be the most difficult. This is borne out by the fact that many of the problems connected with the control of insects in forest products have already been solved. In this work mechanical means of one kind or another are usually resorted to with more or less satisfactory results. Therefore let us turn our consideration to that phase of forest entomology most neglected, that is the control of insects attacking living trees.

There are two distinct angles from which insects infesting standing timber may be attacked. These are, first from the point of view of checking outbreaks after the insects have actually become active and, second, the prevention of outbreaks.

Checking active outbreaks of insects must necessarily depend very largely on mechanical methods of control. Our outstanding examples of the successful checking of outbreaks are to be found in the operations against the Dendroctonus beetles in the West. These operations have been expensive and difficult, but the protection of valuable standing timber has doubtless justified the outlay of time and money. In checking epidemics of leaf eating insects we are at present almost helpless. Spraying or dusting forests with poisons has been considered impractical if not impossible and this is almost the only means that economic entomology has devised which has even the slightest chance of being applied in forest work. Recently experiments in Ohio and in New England have demonstrated the possibility of spraying areas of considerable size by means of a dusting machine attached to an airplane. By this method the work can be carried on very rapidly and with a cheap poison the cost might be brought within the realm of possibility. But it has yet to prove itself economically practical for forest work.

Even though the economical application of poison to forest areas proves a practical possibility we still know little or nothing of the effect that the extensive application of a poison would have upon forest life in general. The trees, the underbrush, and the ground would be unavoidably covered with poison dust. Considerable quantities of poison would certainly fall upon the surface of the lakes and streams, and still more would be washed into such waters by rains. What will be the effect of this poisoning to fish and other aquatic life? How will beneficial insects such as parasites and predaceous forms be affected by the treatment? Since birds feed largely upon insects, what will be the effect upon bird life in the sudden reduction of their food supply? Will the game or the small mammals inhabiting the forest be injured by the poison? In applying such methods of control we must remember that trees are not the only things of economic importance in a forest. We must also remember that the maintenance of the biotic balance within a forest reduces decidedly the chance that any pest will become epidemic. It is decidedly possible that dusting operations once started might so upset this desirable balance of environmental factors that yearly treatment would be necessary and cause in the long run more harm than good. At any rate, even though the airplane did furnish an economical means of application, and even though a cheap and effective poison could be found in sufficient quantities to make wholesale application a possibility, we must certainly answer to our own satisfaction the above questions before a general policy of poisoning for forest insect control can be safely advised.

Even at best mechanical methods of forest insect control are always expensive and at present can only be used under particularly favorable conditions; so unless we can find some cheaper effective means than those at present available it is difficult to see how we can ever expect to get really satisfactory results from the use of such methods. After insects become epidemic in a forest we are almost forced to use some mechanical means if they are to be checked at all. Therefore let us consider the possibility of limiting or actually preventing insect injury to the trees by the proper management of our forest lands, that is to say, silvicultural control.

This is a very recent development in forest entomology, but there has been enough work done along this line to show decided possibilities. In fact it shows us a way to check the losses due to forest insects without materially increasing the cost of producing lumber. It has already

proved the solution of several problems which appeared at one time to be impossible of solution.

About the first work of this sort to be published was that of Craighead on the locust borer. Previous to the publication of his bulletin almost every state in the range of the black locust as well as the federal department had its publication, dealing with this insect. Not one of these many publications could suggest any practical means of reducing the losses in forest plantings of this tree. Craighead put two and two together and found a simple and practical remedy which adds very little to the cost of growing locust posts. He found that by planting in such a way as to shade the trunks of the growing trees either by shadows cast by the trees themselves or by other trees that the injury due to the locust borer is reduced to a minimum. This same principle applies to a number of injurious borers such as the bronze birch borer, and the two lined chestnut borer, neither of which will attack trees growing in a close stand.

Another insect that can easily be controlled by a silvicultural method is the white pine weevil. Several years ago one of us determined that in fully stocked stands of white pine the injury caused by this insect was a negligible matter. At that time the recommendation was made to plant 6′ x 6′ in Minnesota and 5′ x 5′ in the east. If openings caused by the dying out of trees are kept filled by replacement plantings we can be certain of a final crop of straight merchantable trees. Recently Peirson, working independently of any knowledge of this previous work has come to essentially the same conclusions.

In the budworm infested area the balsam is not injured to the same degree in all stands. In the same locality and under similar conditions of soil, elevation, and exposure we frequently find some stands with 100 percent dead balsam and others with less than 50 percent dead. It is evident that in the area where less than 50 percent was killed that some factor or factors had a decided effect in checking the budworm. It seems quite probable that such stands would never have suffered at all from budworm injury had it not been for the excessively heavy infestation in surrounding stands. From the comparison of sample plots in the infested region it appears that the seriousness of budworm injury is related to the composition of the forest. Generally speaking the mixed stand of balsam fir, spruce, and hardwoods is much less susceptible to injury than is the pure or nearly pure stand. The injury is directly proportional to the percentage of balsam fir in the stand. This

fact indicates very strongly that the control of the spruce budworm is possible by the use of silvicultural methods.

It is certain that outbreaks of injurious insects are just as much the result of the operation of well defined natural laws as is any other natural phenomenon. When a certain amount of heat is applied to water it will boil, if the heat is taken away it will cool. Certain factors bring about the changes in the biotic balance in a forest and as a result we have certain species favored at the expense of others. When the favored species is an injurious insect we have an epidemic of the pest. It seems reasonable to believe that if we had more knowledge of the factors involved in bringing about or preventing outbreaks that we might easily reduce the chance of the occurrence of insect epidemics.

A PROGRAM FOR FUTURE PROGRESS IN FOREST ENTOMOLOGY

As already pointed out, the problems of forest entomology divide themselves into two groups: 1, those involving the protection of forest products and 2, those involving the protection of growing timber. Mechanical means are usually available and more or less effective, in the first group, but in the second group the mechanical methods are only economically applicable under particularly favorable conditions. Therefore we must largely turn to silvicultural control for insect pests of growing forest trees.

To confine our attention to the development and application of mechanical methods wherever they can be applied has been the tendency in the past but the time has now come to turn our attention also to the development of silvicultural methods. We can no longer be satisfied with taxonomic and life-history studies of insects in our forests but we must also find some means of controlling these pests. We can no longer avoid the issue by telling the forester that we will help him as soon as he has changed economic conditions to suit our established methods of insect control. We must accept economic conditions as they are and if our old control methods do not fit we must find new methods which can be used. We have already found some encouragement in this new child of forest entomology, silvicultural control. Let us develop this phase of the work and watch it lead us to successes far in excess of our fondest hopes.

SECRETARY A. F. BURGESS: Although I did not hear all of this paper, it seems to me that in addition to the suggestions made, there is need for a more thorough study of natural control agencies and the utilization of natural enemies on some of these problems. A more intensive study

on that phase of forest entomology would give knowledge that would be of great importance and value in assisting in control work.

MR. E. P. FELT: I would like to emphasize, in connection with the control of leaf-eating insects in forests, the desirability of securing better protection of bird life. Of course that will not remedy the situation next week or next month. There have been figures published within recent years showing a material reduction in bird life, and as I have studied the situation in New York State, it has seemed to me that there has been a connection—not perhaps very close—between that and a perceptible increase in the ravages of leaf-eating insects.

Another point in this connection, is this: I imagine most entomologists of this country do not realize that in Massachusetts at the present time there are practically no efforts to control the gipsy moth in ordinary woodland areas, and if that situation is allowed to continue, it is going to be practically impossible to grow trees to timber size in areas infested by the gipsy moth. Think of what this will mean, particularly in this country, as we are facing a serious timber shortage, destined to become more acute as the years progress.

PRESIDENT. J. G. SANDERS: The next paper is by W. H. Brittain, entitled "Some Experiments in the Control of the Cabbage Maggot."

SOME RECENT EXPERIMENTS IN THE CONTROL OF THE CABBAGE MAGGOT (*CHORTOPHILA BRASSICAE* BOUCHE)

By W. H. BRITTAIN, *Provincial Entomologist for Nova Scotia*

ABSTRACT

Experiments with a number of compounds for the control of the cabbage maggot, *Chortophila brassicae* for a period of eight years have shown that considerable latitude in the use of corrosive sublimate is allowable and that even under adverse weather conditions there is no necessity of applying the treatment until several days after the flies appear. It has also been demonstrated that the application remains effective for some time; the same is true of treatments with creosote or anthracene oil dust, though not to the same extent.

During the past eight years experiments in the control of the cabbage maggot have been carried out by the Entomological Division of the Department of Agriculture of Nova Scotia. During this time many methods and materials for the control of the cabbage maggot have been tested. During this period some of these have proved worthless, some have given fair results, while, of those that have given invariable satisfaction, four have survived to be included in the 1922 tests.

It has been our custom in these experiments to run three series of plots. Any new or untried material is thus placed first in our "trial plots,"

where it is tested on a comparatively small scale and with few duplicates or repeatings. Here, if it shows promise, it is promoted next season to the "continuation plots" where it is tested on a larger scale and usually duplicated at least ten times. If in the continuation plots it gives evidence of possessing undoubted commercial value, we endeavor to have it tested according to our instructions by a commercial grower. Two of the treatments that we have used have reached this latter stage and of these one of each have been given an adverse report by one of those who tested it—one of these was an official entomologist and one the director of an experiment station. All the commercial growers secured excellent satisfaction from both treatments.

These four treatments have all been tested in our continuation plots for at least three years and accordingly, we have prepared a table showing the average results for these three years, which should show better than a single year's figures the comparative standing of the different treatments.

In considering the factors that affect the price received we have to consider not only total weight, but also earliness of maturity. The latter is affected by certain treatments or lack of treatment and it is the treatment that produces the greatest weight of earliest maturing cabbage that, as a rule, brings the best price, because the greatest price is usually received for those cabbage that reach the market first. We have based our comparison of the different treatments mainly on the weight of head secured, primarily because we sell by weight, but also because it is the only really quantitative way to record results. If sufficient duplicates are employed to minimize variations in soil, moisture conditions, etc., it undoubtedly gives the most accurate idea of the comparative value of different treatments. Along with the total weight of head we consider the actual price received from the cabbages from each plot, careful records of which are always kept. This is the most practical standard of comparison and the one that has the greatest interest for the commercial grower.

In considering these results it should be noted that with the creosote and anthracene oil dusts, we have used ordinary clay as a filler. All the treatments were applied twice except the tobacco dust-corrosive sublimate mixture, which only received a single application. The first of these applications was made when the flies first appeared, the second a week to ten days later. It should further be noted that all the plants were grown under the very best cultural conditions and consequently

there was less actual loss as a result of the insect's work than would have otherwise been the case.

In comparing these results one with the other and with the check plot, it will be seen that we have here four treatments that give results that can be considered as good commercial control. The difference between them is not so great that it cannot be explained on the basis of experimental error. It is the opinion of the writer, however, that over a longer period of years the different treatments will stand in order of effectiveness about the same as in the table.

CABBAGE MAGGOT CONTINUATION PLOTS
Average of 3 yr's. Results
2250 plants per treatment; 14520 plants per acre

Material	Strength	Per cent Destroyed	Weight Harvested (lbs.)	Price Received	Net Profit per Acre
Corrosive Sublimate	1—1000	.35	6800	$244.41	$1186.38
Creosote Dust	1%	.4	6478	225.49	1030.40
Anthracene Oil Dust	1%	.13	6378	218.86	933.83
Tobacco Dust	99%	.44	6645	243.34	1163.33
Corrosive Sublimate	1%				
Check		35	2148	78.10	356.12

Cost of raising 14520 cabbages and preparing for market $391.80.

TRIALS OF NEW MATERIALS

Each year we endeavor to test a certain number of new materials and owing to the excellent results obtained from creosote oil used as a dust as a control for cabbage maggot, it was decided to endeavor to test the different main types of products that enter into the composition of this material, since, to secure the different ingredients as pure chemicals was not possible. The creosote oil used in these experiments is said to consist of the following:—

1. Liquid neutral hydrocarbon oils.
2. Pitch and high boiling hydrocarbons, such as phenanthrene.
3. Naphthalene.
4. Tar acids or cresylic acid.
5. Pyridine bases.

The Barrett Company furnished us with samples of these ingredients and some others. In addition we obtained a liquid which, for convenience, we have called "gas tar," which is a waste product from the gas works at Halifax. This material is ordinarily designated "ammonia

liquor" and is utilized in the manufacture of ammonium sulphate. It contains 14–15% of ammonia. Otherwise its exact composition is unknown.

These were tested in small experiments in which the plots were arranged in triplicate as follows:

PLOT 1. CRESYLIC ACID. This material contained approximately 80% total cresols, as well as a small proportion of phenol and some of the higher boiling tar acids.

PLOT 2. CRUDE NAPHTHALENE. This was a crude material containing around 85–90% of actual naphthalene, the remainder being oils that mainly accompany naphthalene.

PLOT 3. PYRIDINE BASES, the crude commercial product.

PLOT 4. CRUDE CRESYLIC ACID, 95% dark—a crude dark colored acid containing, however, 95% of tar acids. The tar acids may be anything from phenol up to the higher homologues.

PLOT 5. NEUTRAL HYDROCARBON OIL.

PLOT 6. "RESIDUE." Under this name was used a residue rich in pitch and the higher hydrocarbons such as phenanthrene, to the practical exclusion of the other classes of compounds.

PLOT 7. CRUDE XYLENOLS. These came from tar acids boiling mainly above the cresols and regarding the exact composition of which very little is known.

PLOT 8. CRUDE ANTHRACENE. This was 20–25% material, containing all the other materials such as carbazol, phenanthrene and other solid hydrocarbons of the aromatic series.

PLOT 9. ANTHRACENE OIL.

PLOT 10. CHECK. No treatment.

PLOT 11. "GAS TAR."

It is not thought necessary to record the actual figures from these experiments, since, as only 105 plants were used in each, the actual standing of the different treatments would have little significance. It is sufficient to record that with 15% of the check plants destroyed, casualties of a single plant were recorded from 2 treatments only, viz., naphthalene and crude xylenols. It is evident that all the main classes of products entering into the composition of creosote have a marked insecticidal or repellent value.

EFFECT OF TREATMENTS UPON EGGS AND LARVAE

In ascertaining what latitude we may have in applying the different treatments, we must find out whether the material acts merely to repel the flies or whether it acts directly upon the eggs or upon the larvae and to what extent they are most effective against maggots of different ages. Accordingly, experiments with this point in view were carried out with corrosive sublimate and creosote dust.

The method employed was as follows:—

Twelve young cabbage plants were set out and covered with screens at the time of planting and around each was placed 50 newly deposited eggs. On the ninth day thereafter two plants were treated in the usual manner with corrosive sublimate (1–1,000) or creosote dust 1%, and two more each day for the following five days, when all had received treatment.

In each case an equal number of checks were left untreated. In this series the exact age of the maggots was, of course, unknown. The incubation period for the eggs of this insect may be from 3–13 days, the average varying from about five to eight days in different seasons. Most of the treated plants, therefore, would be infested with very young larvae.

The work was accordingly duplicated with maggots reared in the laboratory, the definite age of which was, therefore, known. Maggots of from 5 to 11 days old were employed.

The results of this series of tests is shown in the accompanying table. It will be seen that in the case of the first series, no maggots managed to survive in any case with the corrosive sublimate, though a varying number were found on the untreated plants. The fact that better results were obtained than last year is doubtless owing to the better penetration of the material due to a moister soil. The results from the creosote are only slightly less satisfactory.

EFFECT OF CORROSIVE SUBLIMATE AND CREOSOTE ON C. M.

Application	No. on treated plant		No. on Check	Remarks
	Corrosive Sublimate	Creosote		
S₁Maggots Reared in Field				
9 days after deposition	0	0	5	
10 " " "	0	0	12	
11 " " "	0	0	24	Tunnelling noticeable in stems with both materials.
12 " " "	0	1	19	Tunnelling noticeable in stems with both materials
13 " " "	0	1	19	Tunnelling more extensive showing where insects had been at work.
14 " " "	0	2	14	Tunnelling more extensive showing where insects had been at work.
S₂Maggots Reared in Laboratory				
5 day old maggots	0	0	7	
6 " " "	0	0	4	
7 " " "	0	1	6	
8 " " "	1	1	10	
9 " " "	0	4	8	
10 " " "	2	2	14	

The figure given for the checks is the average of two distinct lots.

In 1921 the soil was so dry that the roots were not so thoroughly moistened by the corrosive sublimate. That the material actually destroyed or drove off the maggots is shown by the plain evidence of tunnelling seen on many plants where no maggots could be detected.

In the second series one, eight day old and two, ten day old maggots survived with the corrosive sublimate, while the creosote dust has again had a marked effect, though not so pronounced as the corrosive sublimate. The small number found on the check is hard to explain. The mortality is here much greater than we would have expected and greater than was actually obtained in other experiments.

These experiments do not settle exactly in what way these two materials affect the maggots. It has been said that the corrosive sublimate does not destroy the eggs, but repels the young maggots after they hatch. In all our experiments, however, we have never known eggs to hatch after having been properly treated with corrosive sublimate; such eggs after a few days invariably shrivelled up. As for the larvae, it is immaterial, from a practical standpoint, whether they are merely driven off, killed outright, or their constitutions undermined to such an extent that they die a lingering death, as long as we can state definitely that maggots up to a certain age are prevented from injuring the plant. We would gather from these figures that it is quite safe to treat with corrosive sublimate up to at least 14 days after the eggs have been laid and with creosote up to 12 days and that maggots up to 8 days old in the case of corrosive sublimate or 7 days old in the case of creosote are destroyed or driven off.

The efficiency of these treatments is dependent largely upon the season. We know, for example, that when the soil is fairly moist the corrosive sublimate penetrates better and is much more effective than when it is dry. Accordingly, it would be interesting to compare the current year's results with those of 1921, which was a very dry year, whereas in 1922 the precipitation was comparatively heavy and the soil was continuously moist.

Unfortunately no figures are available in the case of creosote dust, but the results of similar experiments with corrosive sublimate upon maggots of known age are shown in the accompanying tables. Two lots of maggots were treated, one under both laboratory and field conditions and one under field conditions only.

The following are the results in tabulated form for the first lot.

LABORATORY AND FIELD TESTS

Age	Conditions	Percentage killed or disappeared.
Eggs	Laboratory	100
	Field	100
	Check	25
1 day	Laboratory	100
	Field	100
	Check	20
2 days	Laboratory	100
	Field	100
3 days	Laboratory	100
	Field	100
7 days	Laboratory	95
	Field	100
	Check	30
9 days	Laboratory	85
	Field	80
14 days	Laboratory	15
	Field	40
17 days	Laboratory	25
	Field	45
Full grown	Laboratory	20
	Field	15
	Check	

Two strengths of $HgCl_2$, viz., 1-1000 and 1-1500, were used on eggs, with 100% killed in each case.

The following are the results from the second lot tested under field conditions only.

FIELD TESTS

Age	Percentage killed or Disappeared
1 day	100
Check	20
2 days	100
Check	40
3 days	100
Check	20
7 days	90
Check	10
9 days	80
Check	15
14 days	10
Check	30
17 days	10
Check	5
Full grown	15
Check	10

It will be noticed that in all cases eggs and larvae up to three days old were destroyed. At seven days from 90 to 100 per cent were killed or disappeared, at nine, from 80 to 85 per cent, at fourteen, a big variation occurs and from this time the results cannot be considered satisfactory or dependable.

No dead maggots were ever found in the field. When the treatment is applied many of the maggots may be observed endeavoring to get away from the area moistened with the liquid. In no case, however, have treated eggs ever failed to be destroyed.

It will be seen from these experiments that considerable latitude in the use of corrosive sublimate is allowable and that even under adverse weather conditions there is no necessity of applying the treatment until several days after the flies appear. We know from other experiments that this material, even though applied before the eggs are laid, remains effective for some time. The same may be said of such treatments as creosote or anthracene oil dust, but not quite to the same extent. Nevertheless, the value of these latter materials in this connection is abundantly proven and experiments looking to their wider use are strongly indicated.

Past President Dean was invited to preside.

PAST PRESIDENT DEAN: The next paper is "Mercuric Chloride—Its Use for the Control of Root Maggots in Cabbage Seed Beds," by Hugh Glasgow.

CONTROL OF THE ROOT MAGGOT IN CABBAGE SEED-BEDS

(A Comparison of Methods)

By HUGH GLASGOW, *Geneva, N. Y.*

ABSTRACT

Control of the cabbage maggot, *Chortophila brassicae* in western New York resolves itself largely into the protection of late cabbage while still growing in the seed bed. Comparisons of the mercuric chloride and cheese cloth methods are decidedly in favor of the former, as regards cost and adaptability, although the method has still to prove its worth during seasons of maximum abundance of the insect. Certain precautions must also be observed since there is danger of burning just as the young plants are pushing through the ground. No other materials tested, except tobacco dust, gave great promise of success.

The cabbage maggot is often thought of primarily as a pest of early cabbage and cauliflower. However, in the cabbage-growing section of western New York, where the production of late cabbage is the rule,

the problem of maggot control resolves itself largely into the protection of the young plants while still growing in the seed-bed.

In this part of the State, where cabbage has developed into one of the major crops and where the seedlings are often produced in immense beds several acres in extent, the protection of the young plants from maggot attack has become a serious problem.

While the pest is not always present in destructive numbers, it is usually common enough to cause an appreciable amount of loss in seed-beds each year. At times it becomes so abundant as to destroy most of the exposed plantings, the result being measured not only by the direct loss to the individual producing the seedlings but by a greatly curtailed acreage set to cabbage during such seasons.

For the protection of seed-beds the chief dependence of cabbage growers during the past ten or fifteen years has been the use of cheesecloth screens applied before or very shortly after the plants appear above the ground. While this method is thoroughly effective and leaves little to be desired so far as control is concerned, it is unfortunately rather expensive and involves a considerable amount of labor. On this account many growers, although recognizing the constant danger of loss from the maggot, continue to produce their seedlings in open beds.

The success which has attended the use of mercuric chloride for the control of the maggot in early cabbage and cauliflower naturally suggested the possibility of adapting this method to the control of the same pest in seed-beds. This, together with the possibility of working out a method of control more flexible and less expensive than screening, led to a series of tests during the past three seasons to determine the practicability of substituting the mercuric chloride treatment for the cheesecloth screen.

In comparing the cost of the two methods, the advantage is decidedly in favor of the mercuric chloride treatment. The total cost of three applications, including labor and bichloride at the rate of one dollar per pound, would be approximately ninety dollars per acre.

To screen an acre of seedlings, distributing the cost of the cheesecloth over five years and that of the lumber over a period of ten years, the total cost per acre would be at least twice that allowed for three applications of the bichloride. This would amount to an added expense of at least ten and twenty cents per thousand plants, respectively, for the two methods.

A further advantage in favor of the bichloride treatment is its adaptability. During some seasons a considerable reduction in the total cost

might be effected; for, if the insect did not appear in sufficient numbers to threaten a serious outbreak after the first treatment, the subsequent applications might be omitted. With screening the total yearly cost is fixed irrespective of the abundance of the pest. On the other hand, the screen, if properly constructed, insures complete freedom from maggot injury as well as affording protection in a large measure from certain other pests, such as the flea beetle, besides stimulating the plants to more rapid growth than where produced in the open.

In the use of mercuric chloride certain precautions must be observed. If the first application is made too soon, just as the young plants are pushing through the ground, there is danger of severe burning. In some cases fifty percent or more of the plants so treated have been lost in this way. This risk, however, is greatly reduced when the first application is deferred until the young plants are well through the ground. If three or four days or even a week is allowed, there appears to be comparatively little danger unless the season is unusually backward and the germination very uneven. After the first application even excessive doses appear to have little effect on the plants, although occasionally a slight stunting is noticed from which, however, the plants quickly recover.

Although a number of materials were tried out on cabbage seed-beds in the course of this work, only one of the tests with mercuric chloride

PLAN AND TREATMENT OF EXPERIMENTAL PLATS

Plat	Row	Seed-bed	Times treated	Date
1	1	———	1	5–2
	2	———	2	5–10
	3	———	3	5–18
1	4	———	4	5–26
	5	———	5	6–4
	6	———	6	6–12
	7	———	1	5–10
	8	———	2	5–18
2	9	———	3	5–26
	10	———	4	6–4
	11	———	5	6–12
	12	———	1	5–18
3	13	———	2	5–26
	14	———	3	6–4
	15	———	4	6–12
	16	———	1	5–26
4	17	———	2	6–4
	18	———	3	6–12
	19	———	1	6–4
5	20	———	2	6–12
6	21	———	1	6–12
		———	Check	

Fig. 1. Diagram showing arrangement of plats in 1921 cabbage-maggot experiments, with respect to number and frequency of applications for each material to be tested.

will be discussed in detail at this time, since the results are fairly typical of all the experiments. None of the other materials tested, with the exception of tobacco dust, gave any great promise of success.

In order to secure data bearing on the problem from as many angles as possible, such as the proper time to commence treatment, the number of applications necessary to secure satisfactory control and the actual benefit to be derived from deferred applications made to beds already infested by the maggot, the following scheme was carried out for each material in all the detailed tests that were made, namely, for each material or concentration to be tested a block of twenty-one continuous rows was selected, such a block being divided into plats of six, five, four, three, two and one row respectively, as indicated on page 70.

Of the six applications to be put on at weekly intervals, the first was made from four days to one week after the plants had commenced to appear above the ground and included all six rows of Plat 1. The second application included the first and second Plats except that Row 1 was omitted from Plat 1. In the case of the third application Plats 1, 2 and 3 were treated with the exception of Rows 1 and 2 of Plat 1 and Row 1 of Plat 2, which were omitted. This process was repeated at intervals of approximately one week until all six applications were made, one new plat in this way being added and one row successively dropped from each of the preceding plats at each application. At the end of this six-weeks' period we therefore have twenty-one different combinations bearing on the time and frequency with which each of the materials tested may be applied.

The accompanying tables summarize the results of such a test carried on in the same cabbage seed-bed during two successive seasons,—1921 and 1922. In this case the material tested was mercuric chloride diluted at the rate of approximately 1-1200 or 1 ounce to 10 gallons of water. The solution was applied with a watering pot from which the rose sprinkler had been removed so that the liquid could be directed along the rows in a solid stream. The applications were made at the average rate of about 1 gallon to 30 feet, more of the solution being required for the late application than where the plants were young.

During 1921 the infestation, while bad, was not as severe as in some seasons, while in the year following it was much less general, the unprotected plats in 1921 showing an average infestation of 73 percent as against 43 percent for 1922.

As may be seen from the results of these tests summarized in Tables 1 and 2, perfect control was secured in 1922 by two early applications.

A single application, while greatly reducing the amount of injury and giving fair commercial control, failed to prevent injury amounting to nearly ten percent of the total number of plants involved. The second application for 1922 gave results distinctly inferior to that made a week earlier, while the plats treated after this time were not greatly superior to those receiving no treatment at all.

In 1921, on the other hand, where the infestation was much more severe, two early applications were necesary to secure results comparable to those secured with a single one during 1922. Three applications were required in 1921 to insure a perfect stand, while treatments made late in the season were correspondingly less effective than in 1922.

This difference in degree of control shown by the mercuric chloride treatment during two seasons when the pest was unequally abundant, suggests that a certain amount of caution may not be out of place in adapting this method to the treatment of cabbage seed-beds. If three applications were required during 1921 to give the same results secured the following year with but two treatments, might not even three dosages prove inadequate during one of those seasons which may be expected to occur periodically when the insect is present in overwhelming numbers.

In any case, until the method has been given a trial during such a season, it is probably not wise to advise its unqualified substitution for the cheesecloth screen.

TABLE 1. CONTROL OF ROOT MAGGOT IN CABBAGE SEED-BED DURING 1921
(Mercuric chloride used at rate of 1 ounce to 10 gallons water)

Plat	Row	Number of applications per row	Date of final application	Number of plants counted	Number infested	Number clean	Percentage clean plants
1	1	1	5–2	210	63	147	70.00
	2	2	5–10	196	17	176	91.19
	3	3	5–18	167	0	167	100.00
	4	4	5–26	190	0	190	100.00
	5	5	6–4	193	0	193	100.00
	6	6	6–12	240	0	240	100.00
2	7	1	5–10	239	78	161	66.94
	8	2	5–18	235	25	210	89.36
	9	3	5–26	203	24	179	88.17
	10	4	6–4	204	17	187	91.66
	11	5	6–12	312	30	282	90.38
3	12	1	5–18	191	120	71	37.17
	13	2	5–26	200	86	114	57.00
	14	3	6–4	166	82	94	56.62
	15	4	6–12	236	145	91	38.59
4	16	1	5–26	170	108	62	36.47
	17	2	6–4	184	92	92	50.00
	18	3	6–12	250	155	95	38.00
5	19	1	6–4	172	132	50	29.07
	20	2	6–12	232	173	59	25.43
6	21	1	6–12	268	206	62	23.31
	Check			1245	902	334	26.82

TABLE 2. CONTROL OF ROOT MAGGOT IN CABBAGE SEED-BED DURING 1922
(Mercuric chloride used at rate of 1 ounce to 10 gallons water)

Plat	Row	Number of applications per row	Date of final application	Number of plants counted	Number infested	Number clean	Percentage clean plants
	1	1	5–12	208	18	190	91.34
	2	2	5–19	218	0	218	100.00
	3	3	5–26	189	0	189	100.00
1	4	4	6–2	198	0	198	100.00
	5	5	6–9	177	0	177	100.00
	6	6	6–16	167	0	168	100.00
	7	1	5–19	178	16	162	91.57
2	8	2	5–26	178	8	170	95.50
	9	3	6–2	133	0	133	100.00
	10	4	6–9	152	0	152	100.00
	11	5	6–16	146	0	146	100.00
	12	1	5–26	153	50	103	67.32
	13	2	6–2	130	45	85	65.38
3	14	3	6–9	156	40	116	74.35
	15	4	6–16	209	70	139	66.55
	16	1	6–2	215	85	130	61.35
4	17	2	6–9	247	90	157	63.56
	18	3	6–16	234	61	173	73.45
	19	1	6–9	210	55	155	73.80
5	20	2	6–16	199	56	143	71.85
6	21	1	6–16	177	65	125	65.78
	Check			1110	482	628	56.16

PAST PRESIDENT DEAN: The next paper is on "The Squash Bug in Massachusetts," by H. N. Worthley.

THE SQUASH BUG IN MASSACHUSETTS

By H. N. WORTHLEY, *Amherst, Mass.*

ABSTRACT

The life-cycle of the squash bug, *Anasa tristis*, in Massachusetts has been worked out and compared with the records for other parts of the country. An attempt to find an efficient insecticide for the destruction of adult bugs without injuring the vines was unsuccessful. Brief notes on a Tachinid parasite, *Trichopoda pennipes* are given.

The squash bug (*Anasa tristis* De Geer) is an ever present pest of cucurbits in Massachusetts. It is locally abundant every year, but causes serious loss only occasionally. The worst damage in Massachusetts appears to occur when overwintered adult bugs are abundant in the spring, sucking the juices of the seedling plants, which are killed outright. Weed and Conradi (5)[1], p. 15, give an account of a serious outbreak in New Hampshire, in which "as soon as squashes, cucumbers, and other plants of the vine family were out of the ground in spring, the

[1]Numbers in parenthesis refer to "Literature cited."

bugs began to destroy them, coming in such extraordinary numbers as to occasion very general comment." It may be that during a dry, hot August the nymphs also would cause serious loss, but within the writer's experience plants which have escaped destruction by the adults are well able to support the nymphs, due to the tremendous mid-summer growth of cucurbits.

Seasonal History

The time during which the various stages in the life of the squash bug are present in Massachusetts is shown in the accompanying chart (fig. 2), which is a record of field observations during the seasons of 1920, 1921, and 1922. In addition, the chart is of interest in its record of the year 1921. A glance at the chart will show that all stages were present in the fields for a shorter time than in the other two years, and that all bugs had left the fields at least a month before the first killing frost. This early completion of its seasonal activities seems best explained by the late fall of 1920 and the mild winter and early spring of 1921. These combined to cause a rapid emergence of the overwintered adults, and a subsequent concentration of oviposition in the latter part of June and early July. Since all nymphs had reached the fifth instar by September first, their development was not retarded by the cool September weather, as in average years. The fact that all adults had left the fields nearly a month before the vines were killed by frost seems to indicate that they normally do only a certain amount of feeding before seeking winter quarters.

In 1921, as soon as the peculiarities of the season were evident, a close watch was kept on bugs in the field and on those in breeding cages as well, but no mating or egg laying by the newly developed bugs was observed. It seems safe to say, therefore, that there is never more than one generation of the squash bug each year in Massachusetts, for if it were possible for a partial second generation to develop, it would surely appear in such a season as that of 1921.

Table 1. Length of Developmental Stages of Squash Bug, Amherst, Mass.

Stage	Number of Individuals	Time days	Average days
Egg	151	11–16	13.7
1st instar	86	3– 4	3.3
2d instar	85	3–11	6.6
3d instar	82	4–13	6.6
4th instar	63	4– 9	6.4
5th instar	59	9–22	16.6

Total from egg to adult 34–75 days, average 53.2 days.

Table 1 is a summary of breeding records obtained in life history cages. The variations exhibited are due in part to temperature differences, but

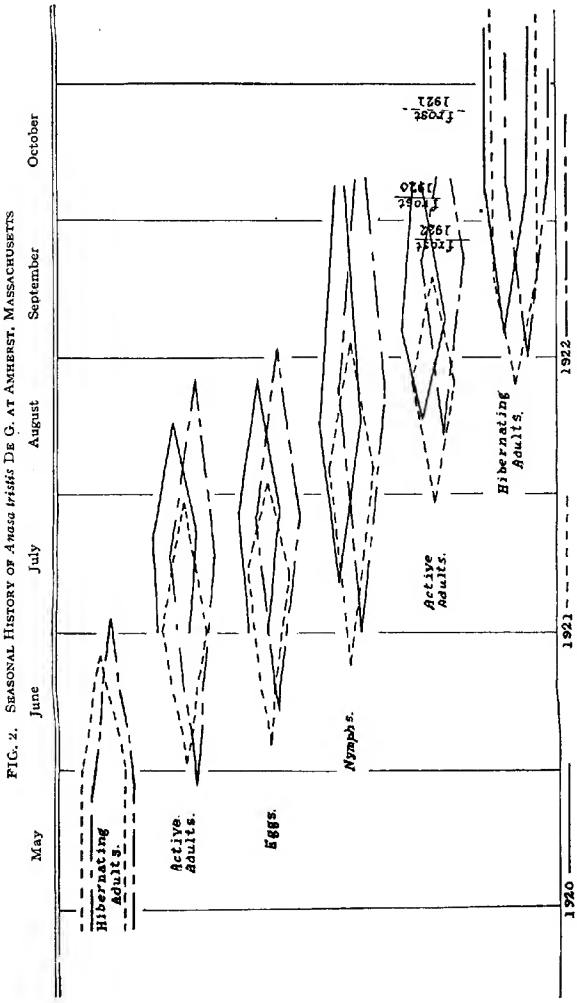

FIG. 2. SEASONAL HISTORY OF *Anasa tristis* DE G. AT AMHERST, MASSACHUSETTS

are also in part individual, since specimens hatching the same day from the same egg cluster and kept in the same cage have been known to become adult as much as fourteen days apart.

A tabulation (Table 2) of the lengths of the various developmental stages shown by the cage records of three seasons at Amherst, compared with the findings of Chittenden (1), p. 24, Weed & Conradi (5), p. 17-18, and Wadley (4), p. 419, is of interest as showing regional variations in the lengths of the different developmental stages.

TABLE 2. DEVELOPMENTAL STAGES OF SQUASH BUG IN DIFFERENT LOCALITIES

Stage	Washington, D. C.	New Hampshire	Kansas	Massachusetts
Egg	9–10 days	11 days	7–17 days	13.7 days
1st instar	3	3	2.1—5.2	3.3
2d instar	8–9	9	6.2—9.2	6.6
3d instar	7–8	8	8.1–13	6.6
4th instar	6	7	10	6.4
5th instar	8	9	12	16.6
Total	41–44 days	47 days	45.4–66.4 days	53.2 days

CONTROL MEASURES

Since the chief injury by squash bugs in Massachusetts seems to be that caused by the overwintered adult bugs and because the vines largely cover the ground by midsummer when spraying for the nymphs must be carried on, an effort has been made to find a material which will kill adult bugs without injuring the vines. The investigation has so far proved fruitless, but it may be of value to report the materials tried, and the results obtained. In each test several bugs were treated, placed on a fresh leaf under a lamp chimney covered with cheese cloth, and kept under observation for three days.

Standard Insecticide (Lemon Oil Co., Baltimore, Md.) 1–16, (3) p. 166.
Against adults—no effect.

Sodium sulfide (3), p. 165.
Against adults—no effect.

Sulco-V. B. (Cook & Swan Co., New York City) 1920[1] sample, 1–25.
This material which is a miscible oil, was partially effective against 4th instar nymphs. Adults, however, were unaffected, and the foliage was killed.

Emulsion of CS_2 and liquid soap, equal parts.
Apparently killed all instars and adults very rapidly but all revived within a few hours of the application.

Linseed Oil Emulsion, 1–9, (3), p. 168.
Against adults—no effect.

Linseed Oil Emulsion, 1–9, plus Black-leaf "40", 1–500.
Against adults—no effect.

[1]The year is given because the material called Sulco-V. B. differed markedly in its composition in 1920, 1921 and 1922.

Black-leaf "40," 1–500.
Not effective against nymphs older than 2d instar.
Black-leaf "40," 1–100, plus soap, 1 oz. per gallon.
Not effective beyond 3d instar.
Nicotine sulfate dust (homemade) about 2%.
Not effective beyond 3d instar.
Nicotine sulfate dust (Cal. Walnut Growers' Ass'n. 1921).
Not effective beyond 4th instar.
Nicotine sulfate dust (Dosch 1922) 4%, killed 15% of adults.
Nicotine sulfate dust (Dosch 1922) 2%, killed 15% of adults.
Fish-oil soap (Sterlingworth) 1 lb. in 3 gals. water.
About 80% effective against 3d instar nymphs.
Fish-oil soap, 1 lb. in 3 gals. water plus 3 oz. sulfur.
Partially effective against 4th instar nymphs, ineffective against adults.
Fish-oil soap, 8 oz.; water, 1 gal.; sulfur, 2 oz.; ineffective against adults, and caused severe burning.

The last-named mixture was reported by F. M. Wadley (4), p. 423, as a satisfactory means of killing adult squash bugs in Kansas. It was hailed with delight by the writer, and given repeated tests. 90% of adult bugs *dipped* in the mixture while it was warm were killed, but only a small percentage of those sprayed with the mixture while warm, and of those dipped or sprayed with the cold mixture, succumbed. In addition, this material caused severe foliage burn.

It will be noted that nicotine sulfate dust killed a few adults in the experiments. Three or four direct puffs were given the bugs, which resulted in a more liberal application than they would ordinarily get in field work. Still, the dust has killed adult bugs, and since there is reason to believe that the dusts will be improved, we may look forward with hope to the production of a material which can be used with safety and success even against an insect which has proved to be as resistant as the common squash bug.

The Tachinid Parasite, *Trichopoda pennipes* Fabr.

A more extensive paper on the biology of this species is being prepared by the writer, but a few statements may properly be given here. This beneficial fly has two generations yearly in Massachusetts. As many as 80% of overwintered squash bugs have been observed to bear eggs of the parasite. Many of these bugs, however, live to deposit a part, at least, of their eggs.

The accompanying chart (fig. 3) explains the relation existing between parasite and host as it appeared in 1922 at Amherst. For economy in space, the egg stages, which are not significant in this connection, have been omitted. Flies of the second generation lay their eggs upon the

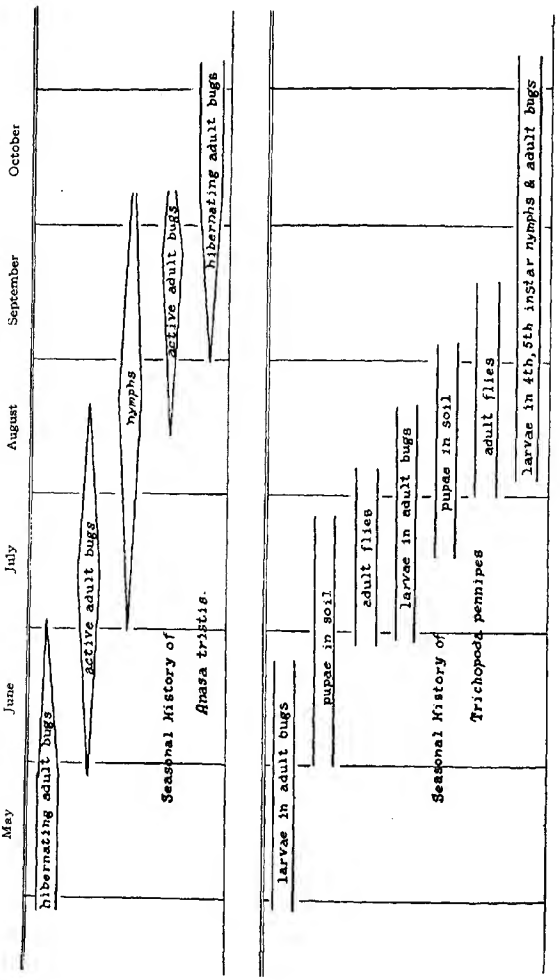

FIG. 8. RELATION OF *Trichopoda pennipes* TO ITS HOST, *Anasa tristis*, AMHERST, MASSACHUSETTS, 1922

older nymphs and adult bugs, and the larvae of this generation pass the winter within the body of the host. None of the bugs parasitized by the second generation flies appear to live long enough to oviposit the following spring. Thus, although the efficiency of the parasite has been questioned, due to the fact that parasitized female bugs have been observed laying eggs, (1) p. 26; (2); (5) p. 21, it would seem that the parasite is capable of causing a considerable reduction in numbers of the host in Massachusetts.

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PAST PRESIDENT DEAN: We will now listen to a paper on "The Onion Capsid," by P. A. Glenn.

THE ONION CAPSID, *ORTHOTYLUS TRANSLUCENS* TUCKER

By P. A. GLENN, *Chief Inspector, Division of Plant Industry, Department of Agriculture, Urbana, Ill.*

ABSTRACT

The onion Capsid, ***Orthotylus translucens***, occurs in Illinois on wild garlic and attacks onions. The life-cycle is briefly summarized and spraying with whale oil soap recommended, Burning over garlic fields and fall plowing are excellent preventives.

This insect pest was seen by the writer at Olney, Illinois, May 15, 1915, on cultivated onion, and was identified for me by C. S. Spooner. The species was described by Elbert S. Tucker from a single male specimen collected in 1894 in Cheyenne Canyon near Colorado Springs. The description was published in Volume IV (old series) XIV (new series) No 2, University of Kansas *Science Bulletin*, 1907. The type is now in the collection of the University of Kansas. Mr. Tucker makes the

following statement in regard to it: "Otto Heidemann considers the specimen 'near *prasinus* Fallen'. The description of *O. viridicatus* Uhl. agrees very closely, the most notable distinction being the black membranes of that species."

May 15, 1915 is the earliest record of its presence in Illinois. The writer has not been able to find any reference to it in economic literature. Its destructive character as revealed by observations made in the vicinity of Olney in 1915, '16, and '17 warrants us in recording it as one of our injurious insects.

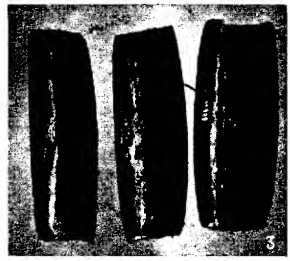
Its chief food plant at Olney was wild garlic, commonly but erroneously called "wild onion" by the people of that locality. No doubt it will accept wild onion as a host plant as readily as wild garlic but this has not been verified. It might therefore, more properly be named the "garlic capsid" but since its economic importance depends upon its relation to the cultivated onion I have chosen to suggest that it be named the "onion capsid."

The tops of the onions on which the insects were first seen were at the time killed half way to the ground and later most of the tops were killed to the ground. The same condition prevailed in a number of patches visited. The insects found were all adults. The owners reported that they had appeared very suddenly a few days before my visit, and that this had been a frequent occurrence in former years in that locality. One man reported later that they were also abundant on the "wild onion" growing in his pasture. This gave a clew to the situation and by observations made during the two following years it was learned that wild garlic, which is abundant in that locality, is the natural host plant of the species.

The eggs are deposited in longitudinal slits made in the fruiting stalks of the plant, as shown in Pl. 1, Figs. 1, 2, and 3, from five to twenty eggs being deposited in each slit. The insect hibernates in the egg stage, hatching continues throughout April, adults begin to appear about the first week in May and are to be found until about June 10, and oviposition begins about May 15th and continues until the adults disappear. A few eggs were found in tops of cultivated winter onions, but cultivated onions do not appear to be nearly as attractive to the female for purposes of oviposition as garlic.

The young nymphs are green with orange colored thorax and red eyes, the later stages and the adults are uniform light yellowish green.

The adults are very active flyers and when abundant swarm from wild garlic fields to the cultivated onion and soon suck the life out of



1. Fruit stock of wild garlic with egg punctures of onion capsid.
2. Radial section of fruiting stock of wild garlic to show eggs of onion capsid in position.
3. Radial section of cultivated onion showing eggs of onion capsid.
4. Wild garlic plants showing onion capsid.

the tops, causing them to turn yellowish white, wilt and die, thus stunting the growth of the onion.

During 1915, 1916 and 1917 they were extremely abundant in the vicinity of Olney. When one approaches infested plants the capsids scurry to the ground and seek shelter under rubbish or in cracks in the ground, and so abundant were they when these observations were made that they almost covered the ground in the garlic fields as one walked through them. Figure 4 will give some idea as to their abundance on the plants.

They were seen at various other points in the southern half of the State, but serious injury was noticed only at Olney. Wherever garlic fields are present the insect may well become a limiting factor in the protection of onions.

Whale oil soap used at the rate of one ounce to a gallon of water killed both adults and nymphs almost instantly. And where garlic fields had been burned over or plowed under in the fall, practically no capsids were present the following year.

President Sanders resumed the Chair.

PRESIDENT J. G. SANDERS: The next on our program is "Pepper Maggot, a New Pest of Peppers and Egg Plants," by Alvah Peterson.

PEPPER MAGGOT, A NEW PEST OF PEPPERS AND EGG PLANTS

By ALVAH PETERSON, *New Brunswick, N. J.*

(Withdrawn for publication elsewhere)

PRESIDENT J. G. SANDERS: We will now listen to a paper on "Dusting for the Pea Aphis," by E. N Cory.

DUSTING FOR THE PEA APHIS

By ERNEST N. CORY, *State Entomologist, College Park, Md.*

ABSTRACT

Dusting is most promising for pea aphis control. The principal tests were to determine the most effective percentage of nicotine. A high nicotine content and not less than 30 lbs. of dust per acre are preferable. The use of a trailer of canvas is advised. There should be at least 50 percent of the vines infested when dusting is begun.

Dusting seems to hold the greatest promise in the economical control

of the pea aphis, owing to the various difficulties that are always present in spraying. This is particularly true in the spraying of broadcast canning peas.

Counts of the yields on infested and uninfested market peas grown in the fall of 1922 at Cambridge, Maryland, showed beyond doubt that the pea aphis does considerable injury.

TABLE I. EFFECT OF APHIS ON YIELD.
Farm of W. A. Byrn, Cambridge, Md.
October 19th, 1922

Yield from 100 feet of heavily infested vines	
Number of pods with two or more peas	892 or 63%
Number of flat pods, unmarketable	517 or 37%
Estimated yield on basis of quantity picked	50 bushels
Yield from 100 feet of uninfested vines	
Number of pods with two or more peas	1891 or 79%
Number of flat pods, unmarketable	512 or 21%
Estimated yield on basis of quantity picked	145 bushels

A comparison of dusted and undusted fields shows that the yields on the former are higher and that the number of marketable peas is increased by control of the aphis.

TABLE II. EFFECT OF DUSTING ON YIELD
Hirst Farm, Cambridge, Maryland
October 12, 1922

Counts from 100 yards of undusted vines	
Number of pods with three or more peas per pod	374 or 37%
Number of pods with one or two peas per pod	192 or 19%
Number of pods with no peas	436 or 44%
Counts from 100 yards of dusted vines, 35 lbs. per acre 5% dust.	
Number of pods with three or more peas per pod	1028 or 44%
Number of pods with one or two peas per pod	682 or 29%
Number of pods with no peas	634 or 27%
Increase in marketable peas	17%

The kind of dust material that gives the best results was tested on fall grown market peas. The tests show that nicotine alone, of all the materials tested, can be relied upon to give satisfactory results. The following table shows in brief the results with various combinations:

TABLE III. TESTS OF INSECTICIDES
Jackson Farm, Cambridge, Md.

Exp No.	Date	Kind of Dust	Quantity in lbs. per acre	Per cent kill	Remarks
1.	9/27/22	Dosch 2.4% Nicotine	45–55	75 80	Light, volatile dust
2.	"	Nicotine 3%, kerosene 5%, lime	45	75 80	
3.	"	Nicotine 3%, lime	55	80	
4.	"	Kilspray 5%, lime	75	10	Pyrethrum extract
5.	"	Derrisine 5%, lime	50	10	
6.	"	Nico-Tone, 1½ % nicotine	35	15	Very heavy
7.	"	Ace-Hy	25	10	
8.	"	Check			No unusual mortality
9.	"	Niagara 3%, nicotine	50	90	
10.	"	Niagara 5%, nicotine	45	95+	

Temperature 75°. Dry. Very little breeze. Noon to 4:30. 85% of plants infested at time of dusting.

The principal tests were on the percentage of nicotine most effective, the quantity that should be used and the method of application.

Table IV shows in condensed form the results. While the dust from several manufacturers was used, no attempt is made to show a comparison as the conditions were different in each case.

The percentage of kill is based on counts of infested plants prior to dusting, and similar counts twelve hours after dusting.

TABLE IV. TESTS OF NICOTINE DUST

Byrn Farm, Cambridge, Md.

Field A.	Exp	Date	Kind of dust	Quantity in lbs. per acre	Per cent kill	Remarks
4 acres	1	9/22/22	Niagara, 2%	15	44	No canvas.
	2	"	Niagara, 2%	30	71	No canvas.
	3	"	Niagara, 3%	30	68	10 ft. canvas.
	4	"	Niagara, 5%	30	78	10 ft. canvas.
	5	10/7/22	Niagara, 3%	25	75–80	3 lbs. Arsenate of lead to kill loopers.
Slight breeze. Temperature 70°–66. Noon to 4:30. 2 rows allowed for drift.						
Field B. 2 acres	1	9/23/22	Niagara, 5%	25	63	10 ft. canvas.
	2	"	Niagara, 3%	43	71.4	10 ft. canvas.
Temperature 78°. No breeze. Noon.						
Field C. 1½ acres	1	9/23/22	Niagara, 5%	50	85–100	18 ft. canvas.
	2	"	Niagara, 5%	25	85–100	18 ft. canvas.

Temperature 78°. No breeze. Noon. Higher per cent kill on middle rows. 4 rows between plots. Average infestation 16.7%.

Austin Farm, Cambridge, Md.

Exp No.	Date	Kind of Dust	Quantity in lbs. per acre	Per cent kill	Remarks
1.	9/26/22	Dosch, 2.4%	110	85–95	With the wind.
2.	"	" "	60	65	Against the wind.
3.	"	" "	30	50	Dusted with and against the wind.
4.	"	" "	30	50	With the wind.
5.	"	Check			

Temperature 75°–80°. High wind. Noon. Per cent plants infested September 21, 1922—41.5

The tests herein recorded were supported by demonstration dusting on a commercial scale at eight farms. The results on these farms, together with the above data, indicates to us that less than thirty pounds per acre of nicotine dust is not practicable and that a high nicotine content is preferable to the low content.

The use of a trailer of canvas is highly desirable in order to get the maximum fumigation, and the dusting should be done in as calm weather as possible. Good results seem to be possible at temperatures around 70° F.

Our experience indicates that to obtain the best results for the money expended in dusting, there should be at least 50% of the vines infested when dusting is begun.

PRESIDENT J. G. SANDERS: The next paper is entitled "The Possibility of Transmitting a Weevil infestation from wheat to macaroni through the process of milling and manufacturing," by Royal N. Chapman.

THE POSSIBILITY OF TRANSMITTING A WEEVIL (*SITOPHILUS*) INFESTATION FROM WHEAT TO MACARONI THROUGH THE PROCESS OF MILLING AND MANUFACTURING

By ROYAL N. CHAPMAN, *St. Paul, Minn.*

(Withdrawn for publication elsewhere)

PRESIDENT J. G. SANDERS: We will now hear a paper entitled "Vacuum Fumigation Experiments Using European Corn Borer and Browntail Moth Larvae Under Winter Conditions," by R. I. Smith.

VACUUM FUMIGATION EXPERIMENTS WITH BROWN TAIL MOTH AND EUROPEAN CORN BORER LARVAE UNDER WINTER CONDITIONS

By R. I. SMITH, *Boston, Mass.*

(Withdrawn for publication elsewhere)

PRESIDENT J. G. SANDERS: The next paper is "Further Data on Fumigation with Hydrocyanic-acid Gas in Greenhouses on a Commercial Basis," by E. R. Sasscer and C. A. Weigel.

FURTHER DATA ON FUMIGATION WITH HYDROCYANIC ACID GAS IN GREENHOUSES ON A COMMERCIAL BASIS

By E. R. SASSCER AND C. A. WEIGEL

ABSTRACT

The formula used was 1 ounce avd. sodium cyanide, 1–½ liquid ounces sulphuric acid (1.83 specific gravity) and 3 fluid ounces of water. Frequent one hour exposures in a greenhouse containing a large number of different plants, were followed by no permanent injury, though temporary burning occurred on such plants as jasminum,

salvia, etc., and the insects were practically eliminated except mealy bugs and these greatly reduced by the killing of immature larvae. Results are also given for the fern scale, the camphor scale and the Florida red scale.

In a preliminary report[1] some data on the subject of fumigating greenhouses with hydrocyanic-acid gas on a commercial basis was presented. The purpose of this paper is to give additional data on the same subject based on experiments conducted during the current year. The following formula was used in all of the tests: For each ounce avoirdupois of sodium cyanid (containing approximately 51% cyanogen), 1½ liquid ounces of sulphuric acid (1.83 specific gravity) and 3 fluid ounces of water were used. This is a slight divergence from the 1–1½–2 formula which has been generally accepted owing to the necessity of securing sufficient dilute acid to submerge the cyanid. Under greenhouse conditions, it is necessary to use a number of generators in order to secure an equal distribution of gas, and as this number is increased, the amount of chemicals in each generator is proportionately decreased, which will result in poor generation unless there is a slight excess of water. If it were possible to have a number of small generators considerably constricted at the bottom it would be possible to get a satisfactory generation with the 1–1½–2 formula.

Experiment I

It appeared advisable to determine whether a greenhouse could be kept free from infestation of the common insects, as white flies, aphids, mealybugs, greenhouse Orthezia, etc., by subjecting the plants thereof to frequent one hour exposures of the gas at weak concentrations. An opportunity to conduct such an experiment presented itself during the early part of this year in a fairly tight propagating house of the United States Botanic Gardens, containing approximately 43,000 cubic feet of air space. The plants growing in this house represented 68 genera or about 120 varieties of the more common herbaceous and flowering plants, most of which were in 3″ pots or rooted directly in the propagating benches. The plants were obtained mostly from cuttings taken late in the season from plants grown out-doors during the summer, and in most cases were quite heavily infested with common mealybugs, greenhouse Orthezia, ants, and other hot house insects, when the experiment was undertaken. The first and second exposures were at the rate of ¾ ounce and ⅔ ounce of sodium cyanid per 1,000 cubic feet of space respectively, while in each of the last five exposures ½ ounce per 1,000

[1] E. R. Sasscer and C. A. Weigel, Jour. Econ. Ent. June 1922, Vol. 15, No. 3, pp. 200–204.

cubic feet was used. The first exposure took place January 6, and the others on the following dates: January 20, February 9, March 1, 17, 31, and April 21. The ventilators were so arranged that they could be operated from the outside and upon completion of the exposures they were opened for 15 to 20 minutes to permit the escape of gas. As is indicated in Table 1, which gives detailed information on the dosage and atmospheric conditions, the average temperatures in the greenhouse ranged between 58.2° F. to 65° F. for the wet bulb, and from 60.2° F. to 70° F. for the dry bulb, with an average humidity of 82%, while the outside temperatures were from 25° F. to 40° F.

TABLE 1.—DOSAGE AND ATMOSPHERIC CONDITIONS ON THE DATES OF FUMIGATION

Date 1922	Amount of sodium cyanid per 1,000 cu. ft. of space.	Temperature in degrees Fahrenheit			Relative Humidity Pct.
		Inside house		Outside house	
		Wet bulb	Dry bulb		
Jan. 6	¼ ounce	63.2	69.5	36	71
" 20	¾ "	63.3	68.6	40	75
Feb. 9	½ "	—	70.0	34	—
Mar. 1	" "	—	64.0	25	—
" 17	" "	64.0	68.0	42	78
" 31	" "	62.4	63.6	44	95
Apr. 21	" "	58.2	60.2	41	89
	Averages	62.2	66.2	37.4	81.6

Results: While slight but only temporary burning occurred on such plants as jasminum, parlor ivy, marguerite daisy, ageratum, salvia, geranium, dahlia, cestrum, heliotrope, and stephanandro, no permanent injury followed. The insects referred to above were practically eliminated with the exception of the mealybugs, and these were greatly reduced in numbers by the repeated fumigations which killed off the immature larvae. These results are significant since they indicate that many of the common greenhouse pests may be controlled in houses containing a miscellaneous collection of plants, by fumigating them at intervals, using a low concentration of gas, without any serious or permanent injury to the plants.

EXPERIMENT II. CONTROL OF THE FERN SCALE, *Hemichionaspis aspidistrae* (Sign.), AND THE HEMISPHERICAL SCALE, *Saissetia hemisphaerica* (Targ.)

The results of another experiment indicate that with one exposure to the gas a house containing *Nephrolepis bostoniensis* in commercial numbers may be successfully fumigated using 1 ounce of sodium cyanid per 1,000 cubic feet of space with an exposure lasting 1 hour.

The air space of this house was 35,000 cubic feet and the fumigation took place between 7 and 8 o'clock at night. The temperature readings

were 68° F. for the dry bulb and 66° F. for the wet bulb, with a humidity of 89%.

In this instance 99% mortality of the fern scale was secured as compared with 80% of the hemispherical scale. In addition to *Nephrolepis bostoniensis*, two other varieties of ferns, viz: *N. scottii* and N. Teddy Jr., were represented. The latter suffered severe burning as did the following florist's greens, *Asparagus plumosus* and *A. sprengeri*, which were also in the greenhouse fumigated.

EXPERIMENT III. CONTROL OF THE CAMPHOR SCALE, *Pseudaonidia duplex* (Ckll.)

The fumigation tests conducted at New Orleans during August and September 1921, and again in January and February 1922, indicated that 1 ounce sodium cyanid per 1,000 cubic feet of space was effective against this coccid when the temperatures ranged from 45° F. to 70° F., whereas ¾ ounce per 1,000 cubic feet sufficed at temperatures above 70° F. These results are based on the examination of 20,470 specimens.

MISCELLANEOUS FUMIGATION RESULTS

At intermittent periods during the year numerous box and greenhouse fumigation tests were carried on, and further data were accumulated on the control of the insects and host plants listed below.

The Florida red scale, *Chrysomphalus aonidum* (Linn.), on palms, ficus, citrus, and camphor, was controlled by fumigation at the rate of 1 ounce sodium cyanid per 1,000 cubic feet of space, at a temperature of 78° F. and 87% humidity, with no injury to the plants. Similarly with *Saissetia nigra* (Nietn.), on adiantum ferns, roses, moon-vine, peristrophe, citrus and camphor, a mortality of 83% resulted from two exposures to the gas at same rate, at a temperature of 67° F.; also *Chrysomphalus dictyospermi* (Morg.); *Pseudococcus nipae* (Mask.); *Cerataphis lataniae* (Bois.), on Kentia and Areca palms; and *Parlatoria theae viridis* Ckll. on Aucuba japonica, a 98% control was obtained, with no injury to the host plants. The fumigated plants showed a decided stimulation of growth.

PRESIDENT J. G. SANDERS: This is a line of work that promises great development and is an interesting and profitable one. I believe our greenhouse men probably have received less thought and attention from the entomologists and plant pathologists than any other line of agriculturists.

We will pass to the next paper on the program "Results of Spraying and Dusting for the control of the red spider," by D. M. DeLong.

RESULTS OF SPRAYING AND DUSTING FOR THE CONTROL OF THE RED SPIDER (*PARATETRANYCHUS PILOSUS*)

By D. M. DeLong, *Ass't Prof. of Entolomogy, Ohio State University*

ABSTRACT

Red spider, *Paratetranychus pilosus*, has been a serious pest on several types of fruit trees in the Erie-Chautauqua fruit section. The mites appear on the foliage early in the spring and develop from egg to adult in two to three weeks, there being such an overlapping that eggs and adults were always present; consequently effective dusts must remain active upon the foliage for some time. A lime sulphur wash, 1 to 40 easily controls red spider, though it is too strong for prune foliage, which at times may be seriously injured by 1 to 75. The control by various sulphur dusts in combination with arsenate of lead or nicotine did not vary greatly, ranging from 50 to 60 percent. Soap added to a lime sulphur wash, increases its value by at least 5 to 10 percent. A 1 percent lime sulphur with 6 lbs. of sulphur paste for each 100 gals. and 1 lb. of resin fish oil soap gave very satisfactory control.

For several years the red spider (*Paratetranychus pilosus*) has been a very serious pest on the foliage of several types of fruit trees in the Erie Chautauqua fruit section. Injury has been especially serious on the foliage of York State prunes, in many cases being so conspicuous that the yellowing of the foliage could be noticed at some distance from the orchard. As a consequence severe losses were suffered due to the delayed ripening, sour flavor and smaller size of fruit at the time of picking. Also where the trees were heavily loaded premature dropping of fruit was noticed after the foliage was seriously injured. The red spiders appeared on the foliage very soon after the leaves were out in the spring, having over-wintered in the egg stage on the bark, and were present in increasingly large numbers on both surfaces of the leaf throughout the season. No accurate data were obtained concerning the number of generations during the summer, but individuals were able to pass from the egg to the adult stage in from two to three weeks and the generations overlapped to such an extent that eggs and adults were always present. Thus the problem of control is in obtaining some material which will remain active upon the foliage for some time so that a second application after the eggs hatch will not be necessary. Several combinations of dust and spray have been used in an attempt to obtain the best control. Sulphur dust has been recommended by several stations as the best method of control. At least five different combinations of sulphur dust were used. 1. Sulphur dust alone; 2. Sulphur Arsenate of lead dust 90–10; 3. Sulphur, arsenate of lead-lime dust 75–10–15; 4. Sulphur dust with 1% nicotine; and 5. Sulphur dust with 3% nicotine sulphate. The dust was applied from both sides of the row, there was

no wind during the application and a very uniform and thorough covering of the foliage was secured. The trees were about 12 years old and approximately 2 lbs. per tree was used.

There was very little difference in the amount of control secured on the different dust plots, the number ranging from 50% to 60%. The nicotine dust gave no better results than the sulphur dust alone, although applied while the foliage was wet with dew. The addition of lime and arsenate of lead seemed to make no difference in the percentage of killing. For several days following the application the sun was bright and the temperature was high which should have produced ideal conditions for the liberation of sulphur dioxide and consequent killing. Thus the dust acted only as a check and could not be considered an economic control.

In order to get a comparative test, sprays were also used. The lime sulphur alone used at the rate of 1 to 65 and 1 to 75 gave a good control but was rendered more effective by the addition of resin fish oil or even laundry soap at the rate of one pound to 50 gallons. The soap although incompatable seemed to increase the toxicity at least 5 or 10%.

The California recommendation of T. D. Urbahns is a much better spray and gave a very satisfactory control. This mixture is composed of a one percent lime sulphur solution to which has been added six pounds of sulphur paste for each 100 gallons. In California a paste spreader has been used, but a pound of resin fish oil soap added greatly to the efficiency when used with this mixture in place of the paste spreader.

It might be quite possible and easy to control the red spider with lime sulphur alone if it could be used at a 1 to 40 strength but this is too strong for prune foliage. The tender foliage and caustic properties of lime sulphur must be seriously considered in choosing this spray formula. At certain times a solution as strong as one gallon of lime sulphur to fifty of water can be used without injury to the foliage. At other times a mixture of one gallon to seventy-five of water will cause conspicuous burning. The condition favorable for burning in this case seems to be the abundance of humidity in the air and the consequent slow drying of the spray as it hangs on the edges and tips of the leaves. If the spray dries quickly, no burning results. If it hangs on the leaf for some time in a liquid condition it will burn in almost every case. This was well illustrated by a row of trees sprayed in the evening just before sundown. The portions of the trees exposed to the sun dried and were not injured while the shaded portions upon which the spray did not dry, although applied first from the same tank, were burned

severely. It therefore is necessary to be very careful to use a weaker solution upon prune foliage when attempting to control red spider.

MR. J. S. HOUSER: We have been doing some work with this pest in northern Ohio near Youngstown where it has been prevalent for at least three years. This orchard has been carefully sprayed each season, using the dormant application of lime sulphur and the full complement of summer sprays in which lime sulphur liquid 1–40 was the fungicidal agent employed. The dormant strength lime sulphur had failed to destroy the overwintering eggs and the summer applications had failed to destroy the hatched mites. However, miscible oil applied in the spring was found to be very efficient in destroying the over-wintering eggs and the treatment was observed to have a lasting effect throughout the season.

MR. E. N. CORY: In Maryland our results have been somewhat similar to those in Ohio, but we were unable to get lasting effects with miscible oil. During the last two seasons when the weather has been very hot, the mite has increased to such an extent that it has caused serious damage and the ordinary summer sprays in dry weather have caused considerable burning.

PRESIDENT J. G. SANDERS: Did you try self-boiled lime sulphur?

MR. E. N. CORY: We used it in one orchard this year with fair results.

MR. PHILIP GARMAN: In Connecticut we tried several different sprays and we had fair success, as a summer spray, with lime sulphur with nicotine added. We also had good success with soap solution—fish oil soap and ordinary laundry soap. There was a third combination devised for the control of red spiders on cucumbers in Massachusetts, known as "linseed oil emulsion." The latter spray, I think, gave as good control as anything I have ever seen.

PRESIDENT J. G. SANDERS: Is not that emulsion rather expensive?

MR. PHILIP GARMAN: The cost will not amount to very much more than lime sulphur. The total cost was about $1.50 per hundred gallons.

PRESIDENT J. G. SANDERS: The next paper is "The Insecticidal Properties of Tobacco Dust," by P. J. Parrott and Hugh Glasgow.

THE INSECTICIDAL PROPERTIES OF TOBACCO DUST

By P. J. PARROTT AND HUGH GLASGOW, *Geneva, N. Y.*

ABSTRACT

Commercial tobacco dusts vary greatly in nicotine content and physical properties, the finer dusts killing a larger percentage of the spirea aphis, the currant aphis and the apple red bug. Rosy aphis was combated effectively with either nicotine sulphate

or tobacco dust in lime sulphur and glue sulphur sprays. Considerable trouble was encountered with certain types of spraying machines from clogging of the nozzles and strainers. Pumps with poppet valves and rather coarse strainers gave less trouble. Fine tobacco dust undiluted or with 10 percent of lime hydrate showed marked toxicity. The insecticidal properties of tobacco dust, on an average were not uniformly as high as that of dust mixtures containing nicotine sulphate. The concentrated tobacco solutions are apparently more economical than powdered tobacco.

Tobacco dust has long been employed to combat certain injurious insects, but very little data, apparently, are available dealing with its insecticidal properties and range of usefulness for the protection of garden, field or orchard crops. In the literature disseminated by agricultural institutions, various commercial extracts in concentrated form such as nicotine sulfate or nicotine solution are commonly recommended. Usually little, if any, mention is made of powdered tobacco.

During the course of our studies relative to susceptibility of sucking insects to dusting preparations, provision was made for a number of tests to determine the killing properties of tobacco dust incorporated in dusting and spraying mixtures. The present paper deals with some of the more important facts gained from these experiments.

The Nicotine Content and Physical Properties of Tobacco Dust

In the Virginia Station Bulletin 208, Ellett and Grisson state "that the nicotine content of tobacco varies greatly, depending upon many factors. The fertility of the soil and the kind of soil both have influence. In curing, the temperature is often allowed to run too high and nicotine is lost by volatilization. To ascertain the amount of nicotine, chemical analysis is required." The nicotine content of Virginia tobacco is as follows: stems, 0.48 to 0.60 percent; sweepings, 0.73 to 0.88 percent; N. L. Orinoco, 5.35 to 5.62 percent; olive, 3.63 percent; light, 2.9 percent; smoker, 2.30 percent; wrapper, 3.05 percent; cutter, 3.46 percent; dark, 2.83 percent; medium smoker, 3.76 percent; and common smoker 2.47 percent. "Stems had less nicotine content than leaves and dark varieties of tobacco, as Narrow-leaf Orinoco and Burley, had higher ratios of nicotine than bright or flue-cured types."

There is, apparently, no standard for tobacco dust either with respect to nicotine content or physical condition. In comparison with the foregoing figures, it is interesting to note that analysis of various lots of tobacco dust purchased in the State of New York showed considerable variation in nicotine, as follows: Sample 1, 0.88 percent nicotine; Sample 2, 0.58 percent; Sample 3, 0.50 percent; Sample 4, 0.95 percent; Sample 5, 0.98 percent; and Sample 6, 1.00 percent.

A few grades of tobacco dust purchased during the past summer were quite fine, but the larger number of samples contained a considerable amount of coarse material. Most preparations consisted of fine and coarse particles in varying proportions. A common constituent of tobacco was clay or dirt or other cheap adulterant substance or filler.

In our experiments we used a tobacco dust which was guaranteed to contain 1 percent nicotine. The physical properties of tobacco dust were as follows: Less than 50-mesh screen, 18 percent; 50-mesh, 27 percent; 100-mesh, 1 percent; 150-mesh, 10 percent; and 200-mesh, 44 percent.

To obtain larger amounts than were available of the more finely pulverized material, the tobacco dust was ground for six hours or more in a ball machine. This is not an entirely satisfactory outfit for the purpose because of the large amount of time required for grinding and its failure to pulverize completely all the coarse particles. Regrinding, even with this machine, did improve greatly the physical properties of common grades of tobacco dust. This is shown by comparing the foregoing figures relative to untreated tobacco dust with the accompanying analysis of a sample which was subjected to grinding for several hours:—Less than 50-mesh, 1 percent; 50-mesh, 11 percent; 100-mesh, 2 percent; 150-mesh, 12 percent; and 200-mesh, 74.5 percent. Supplies of tobacco dust of different degrees of fineness were obtained by passing the reground material thru screens of designated sizes. In the spraying operations the reground tobacco dust was always used, and even with this, considerable difficulty was sometimes experienced in maintaining a uniform discharge of the spray because of the clogging of the suction strainer and unseating of the ball valves.

Experiments with the Spirea Aphis

In this series of tests reground tobacco was compared with dust mixtures containing 1 percent nicotine. Sheets were attached firmly to the collar of each plant and "tanglefoot" was applied to the edges of the sheets to prevent the insects from escaping. Thoro applications of both kinds of dust materials were made. Twenty-four hours after treatment the number of dead and live insects were counted. With the exception of the coarser grades of tobacco dust all or a majority of the aphids were usually dislodged by the applications, and there is little doubt that the plants received greater protection than is indicated by the recorded killing efficiencies. The data are presented in Table 1.

TABLE 1. THE EFFECT OF APPLICATIONS ON SPIREA APHIS

	Number of insects	Percentage of aphids killed
Reground tobacco dust, less than 50-mesh	778	8.5
Reground tobacco dust, 50-mesh	747	16.3
Reground tobacco dust, 100-mesh	1036	73.7
Reground tobacco dust, 150-mesh	1019	76.8
Reground tobacco dust, 200-mesh	1391	89.7
Reground tobacco dust, 100-mesh with 10-percent lime hydrate	1018	78.0
Reground tobacco dust, 150-mesh with 10-percent lime hydrate	979	83.0
Reground tobacco dust, 200-mesh with 10-percent lime hydrate	1566	84.0
Kaolin with 1 percent nicotine	1699	98.8
Lime carbonate with 1 percent nicotine	1706	99.1
Lime hydrate with 1 percent nicotine	1475	96.8
Sulfur with 1 percent nicotine	1681	96.8

EXPERIMENTS WITH THE CURRANT APHIS

Dust mixtures were applied at the rate of 1 pound per bush and spray mixtures at the rate of 2⅓ gallons per bush. Three applications were made to all the plats. With the possible exception of the sulfur-lead-arsenate dust containing 0.5 percent nicotine, the various preparations proved about equally effective in protecting currants from important curling of the foliage. At the conclusion of the period of infestation counts were made of the healthy and injured leaves on each bush. The data are given in Table 2.

TABLE 2. EFFECTIVENESS OF SPRAY AND DUST MIXTURES IN CONTROLLING THE CURRANT APHIS

Treatment	Percentage of injured leaves per bush
Spray (1 pint nicotine sulfate with 6 lbs. soap to 100 gals. water)	1.01
Dust (90–10 mixture with 0.5 percent nicotine)	2.82
Dust (90–10 mixture with 1.0 percent nicotine)	.41
Dust (90–10 mixture with 2.0 percent nicotine)	.13
Dust (reground tobacco containing 1.0 percent nicotine)	.20
Check No treatment	27.16

EXPERIMENTS WITH THE ROSY APHIS

In this series of tests a number of Greening trees were dusted with reground tobacco and others were sprayed with lime-sulfur at the usual dilution containing tobacco dust. For purposes of comparison, applications were made of lime-sulfur carrying nicotine sulfate and dust

TABLE 3. INFLUENCE OF DELAYED DORMANT APPLICATION OF DUST AND SPRAY MIXTURES ON ROSY APHIS

Number of plat	Treatment	Number of trees examined	Average No. of apples per tree	Average No. of aphis apples	Percentage aphis apples
1	Spray (tobacco dust, 40 lbs. per 100 gals. of sulfur-glue mixture)	8	2207	43	1.95
2	Spray (tobacco dust, 40 lbs. per 100 gals. of lime-sulfur 1–40)	8	867	22	2.65
3	Spray (tobacco dust, 25 lbs. per 100 gals. of lime-sulfur 1–40)	8	925	11	1.25
4	Spray (nicotine sulfate, ¾ pint per 100 gals. of lime-sulfur 1–40)	32	1086	20	1.99
5	Dust (reground tobacco dust, 5 lbs. per tree)	8	1408	261	19.02
6	Dust (90–10 mixture with 2 percent nicotine)	12	1735	324	19.16
7	Dust (90–10 mixture with 1 percent nicotine)	12	1211	347	27.73
8	Dust (90–10 mixture with 0.5 percent nicotine)	14	1797	487	29.74
9	Check	4	2225	719	32.31

mixtures consisting of sulfur-lead-arsenate (90–10 formula) with 0.5, 1, and 2 percent nicotine, respectively. The materials were applied as the apple buds were opening and the aphids were appearing on the tips of the young leaves. The effectiveness of the different mixtures in protecting fruits from injury is indicated in Table 3.

Experiments with the Apple Red Bug

The applications of dust and spray mixtures were made to Greening apples when the petals had dropped from the trees. The experiments were conducted in two different orchards. The methods followed in these experiments, the selection of dust and spray mixtures, and principal results are clearly indicated in Tables 4 and 5.

Table 4. Comparative Susceptibility of Red Bug Nymphs to Dusting and Spraying Mixtures

Material	Number of trees examined	Amount of material per tree	Average No. of insects dislodged		Average percentage killed
			number living	number dead	
Reground tobacco dust	1	8 lbs.	12	186	93.9
Sulfur-lead-arsenate dust, 0.5 percent nicotine	3	2 lbs.	18	59	78.8
Sulfur-lead-arsenate dust, 0.5 percent nicotine	2	5 lbs.	52	988	95.0
Sulfur-lead-arsenate dust, 1.0 percent nicotine	3	2 lbs.	27	91	73.3
Sulfur-lead-arsenate dust, 1.0 percent nicotine	2	5 lbs.	0	155	100.0
Sulfur-lead-arsenate dust, 2.0 percent nicotine	1	5 lbs.	0	199	100.0
Spray (tobacco dust 40 lbs. per 100 gals. lime-sulfur 1–40)	1	15 gals.	1	331	99.7
Spray (tobacco dust 40 lbs. per 100 gals. lime-sulfur 1–40)	1	25 gals.	4	185	97.9
Spray (nicotine sulfate 1 pint in 100 gals. lime-sulfur 1–40)	1	7½ gals.	17	349	95.4
Spray (nicotine sulfate 1 pint in 100 gals. lime-sulfur 1–40)	1	15 gals.	1	478	99.8
Spray (nicotine sulfate ¾ pint in 100 gals. lime-sulfur 1–40)	1	15 gals.	39	162	80.6
Spray (nicotine sulfate ¾ pint in 100 gals. lime-sulfur 1–40)	1	25 gals.	21	86	80.4

Table 5. Comparative Susceptibility of Red Bug Nymphs to Dusting Mixtures

Material	Amount per tree	Number of insects dislodged		Percentage killed
		number living	number dead	
Reground tobacco dust with 10 percent lime hydrate	5 lbs.	26	888	97.2
Reground tobacco dust with 10 percent lime hyrdate	5 lbs.	28	395	93.4
Reground tobacco dust with 10 percent lime hydrate	5 lbs.	9	188	95.4
Reground tobacco dust with 10 percent lime hydrate	5 lbs.	5	19	79.2
Reground tobacco dust with 10 percent lime hydrate	5 lbs.	8	52	86.7
Reground tobacco dust with 10 percent lime hydrate	5 lbs.	27	424	94.0
Reground tobacco dust with 10 percent lime hydrate	5 lbs.	9	151	94.4
Reground tobacco dust with 10 percent lime hydrate	10 lbs.	7	321	97.9
Tobacco dust	5 lbs.	15	223	93.7
Tobacco dust	5 lbs.	5	174	97.2
Lime hydrate with 2 percent nicotine	5 lbs.	1	201	99.5
Lime hydrate with 2 percent nicotine	5 lbs.	1	220	99.5
Summary				
Tobacco dust with 10 percent lime hydrate	5 lbs.			91.5
Tobacco dust with 10 percent lime hydrate	10 lbs.			97.9
Tobacco dust	5 lbs.			95.5
Lime hydrate with 2 percent nicotine	5 lbs.			99.5

SUMMARY

Commercial grades of tobacco show a lack of standardization since they vary greatly in nicotine content and physical properties.

In experiments against the spirea aphis reground tobacco (1 percent nicotine) of 100, 150 and 200-mesh fineness killed a larger percentage of the insects than the coarser grades of the material.

Fine tobacco dust displayed a high rate of toxicity against the spirea aphis, the currant aphis and the apple red bug. Its insecticidal properties, on an average, were not uniformly as high as that of dust mixtures containing nicotine sulfate.

The rosy aphis was combated effectively with either nicotine sulfate or tobacco dust incorporated in lime-sulfur and glue-sulfur sprays. Unpublished data record similar results with the casein-sulfur spray. In comparison, dust mixtures consisting of or containing tobacco dust and nicotine sulfate as killing agents gave less efficient control of the insect.

Considerable trouble was encountered with certain types of spraying machines from clogging of the nozzles and strainers, as well as unseating of ball valves thru the accumulation of tobacco dust in the valve seats. Less difficulty was experienced with pumps equipped with poppet valves and rather coarse strainers.

Fine tobacco dust, undiluted or mixed with 10 percent of lime hydrate, displayed very desirable physical properties for dusting purposes.

In view of the data presented, it is concluded that tobacco dust possesses marked insecticidal properties. The season's results also suggest that it could doubtless be used with great advantage for combating a number of common injurious insects.

Considering present prices of commercial brands of tobacco extracts and tobacco dust in relation to nicotine content, the concentrated solutions are apparently more economical than powdered tobacco.

Data are needed relative to the utility of tobacco dust as an insecticide for specific pests and its economy in comparison with other tobacco preparations.

PRESIDENT J. G. SANDERS: We will now hear a paper entitled "Some Further Experience with Nicotine Dusts," by T. J. Headlee.

SOME FURTHER EXPERIENCES WITH NICOTINE DUSTS

By T. J. HEADLEE, *New Brunswick, N. J.*

(Withdrawn for publication elsewhere)

MR. WILLIAM MOORE: One reaction of nicotine not generally recognized is its ability to unite with carbon dioxide of the air, to form nicotine carbonate. This reaction occurs under moist conditions, but free nicotine would be again liberated under dry and warm conditions. The reaction is similar to that of ammonium carbonate.

Session adjourned 5.30 p. m.

Scientific Notes

Practical Control of Eleodes hispilabris Over an Extensive Area. Experiments in 1921 that were successful in the control of Eleodes adults over a small area were repeated on a much larger scale in 1922. Experiments were in cooperation with farmers and the area treated embraces approximately 18,000 acres. It was further demonstrated that control is practical and economical by poisoning the beetles soon after emergence and before they have had an opportunity to lay eggs that produce the succeeding generation. Beetles emerge in July and August and do not oviposit until the following May. A poison mash made of bran, Paris green, amyl acetate and water distributed broadcast or in the bottoms of furrows plowed at regular intervals killed the beetles effectively at a cost of about 2½c per acre for materials. One man and a team and driver readily treated 320 acres per day. One cooperator combined the plowing and distribution in one operation thus greatly increasing the acreage treated per day. Results were directly proportional to thoroughness of application. Where the individual farmer was sincere and painstaking in his work almost complete eradication of the beetles was obtained.

CLAUDE WAKELAND,
Experiment Station Entomologist, University of Idaho.

Introduced mite attacking Willow. During August, 1922, the attention of the writer was called to a heavy mite infestation on willow, *Salix alba*, at Chambersburg, Pa.

The mites were not only on the leaves but had spun their webs over the main trunk of the tree almost to the ground and over all the limbs so that the tree had a peculiar light shining appearance. An adjoining black willow was also infested altho not so heavily.

Specimens of the mite were sent to Dr. Ewing who identified them as *Schizotetranychus schizopus* Zacher. The only reference the writer could find to this species is contained in a paper by E. A. McGregor in Vol. 56, Proc. of the U. S. Nat. Mus., 1919. It has been recorded only from Germany. Zacher found it on several species of willow at Dahlem, Germany, and described it in 1910. It is of interest to note that *Salix alba* is an introduced species of willow.

J. R. STEAR,
Chambersburg Laboratory, Penna. Dept. of Agriculture

"Fire Ant" Injurious to Potatoes in California.—While conducting field investigations in the upper or southern part of the San Joaquin Valley, I was told by the proprietor of a hotel that a stinging ant was destroying potatoes in the vicinity of

Wasco. An examination of the potato vines growing in sandy soil showed numerous ants tunneling in the stalks on April 16, 1919. In all probability, the potatoes were planted in the favorite nesting grounds of this ant.

Prof. W. M. Wheeler determined the ant as a subspecies of the common "fire ant" (*Solenopsis geminata* Fabr. subsp. *maniosa* Wheeler) and states that it is abundant in Southern California, especially in the environs of Santa Barbara, Pasadena and Los Angeles, in the Southern States and the tropics in general. It has on many occasions been seen to eat green vegetable matter, even strawberries, tender shoots etc., so that I am not surprised that you should have found it tunneling in potato plants. It is also a seed-storing ant. It usually nests in open, sunny, sandy places. This ant stings badly, hence its name "fire ant." In Texas I have known the common form to kill young chickens.

HENRY H. P. SEVERIN, Ph.D.
California Agricultural Experiment Station

Dengue Fever and Mosquitoes in the South. A severe epidemic of dengue fever swept the Southern States during the present season. This outbreak is probably the most severe the South has ever experienced, or at least the worst which has occurred in many years. While there have been comparatively few deaths due to the malady there has been tremendous economic loss and much individual suffering.

According to morbidity reports the disease first appeared in Florida the latter part of May, and that state showed a large number of cases throughout the season. The number of cases reported reached the maximum during the latter part of September, although October reports are not available. The disease apparently entered Georgia from the south, being first recorded in that state on August 19. The disease was also recorded in Texas rather early in the season, the first cases (200) being reported from Galveston on July 17. From that point and other southern Texas cities the malady was soon introduced into various parts of Texas, and a great number of cases occurred, especially in the larger centers. In Dallas, for instance, up to November 1st a total of 3,476 cases were reported. Dengue was first reported in Alabama on August 26, in Louisiana on September 2, South Carolina on September 16, Mississippi on September 30, and Arkansas on October 7. At least a few cases of the disease also appeared in Oklahoma late in the season and some were also unauthentically reported from Tennessee.

The yellow fever mosquito (*Aedes aegypti*) has been shown to be an effective carrier of this malady and it is probable also that *Culex quinquefasciatus* may be concerned. The former species was present throughout the Southern States in considerable numbers during the summer and fall, although apparently not much more numerous than usual. *C. quinquefasciatus* was also abundant, at least in some localities, but usually it is not as frequent an intruder in the house as the yellow fever mosquito.

F. C. BISHOPP

A Repellant For Flat Headed Borers. For many years we have been searching for some repellant that will exclude flat-headed borers from apple and other trees. As a result of this search we have finally hit on the following mixture which seems to fill the requirements of the situation inasmuch as in our tests during three years just past the exclusion of borers has been practically complete.

During 1922 the formula stood as follows:—

Common laundry soap	50 pounds
Water	3 gallons
Flake naphthaline	25 pounds
Flour	2 pounds

Place the soap in the water over steam-pipes and allow it to soften for a few days. Use a potash soap which will form a smooth mixture, not a soda soap since the latter becomes jelly-like. Then place in a double boiler (we use a medium sized wash-boiler placed inside a very large one) and cook until the temperature reaches 180° Fah. Stir in the flour and add the naphthaline and bring the temperature to 180° Fah. at which temperature the naphthaline will have melted, the melting point of naphthaline being 176°, then cool as quickly as may be, stirring the mixture occasionally.

The more rapidly the mixture is cooled the smaller will be the crystals of naphthaline.

In our experimental work this mixture was made up during the winter and stored in air-tight drums. It should be applied with a brush after warming and thinning slightly to the consistency of heavy cream. In our trials, applications were made every three weeks beginning on June 1st, and in no case thus far has any injury to the trees resulted. At the same time almost no flat-heads have been found in trees so protected although they abounded in the checks and in some cases had done very serious injury to young trees in the same orchards previous to the application. Our tests have covered a period of about four years and have been made on several thousand trees.

It seems likely that it will be possible to extend the interval between treatments without losing a reasonable insurance against attack and perhaps the same treatment will protect other borers of the trunks and limbs of various trees.

R. H. PETTIT
Michigan Agricultural College

A Parasite of the European Rose Slug Egg. The European rose slug, *Caliroa aethiops* Fabr., is very destructive to rose bushes in Lawrence, Kansas, every season. It renders most unsightly all bushes that have not been protected by sprays. In early May, 1919, my attention was called to the fact that a large number of the egg blisters were brown, or shiny black. Many egg-bearing leaves were gathered and brought to the laboratory for study. From these black shiny eggs there emerged the little wasp parasite that has been determined for me by Mr. Rohrer, as *Trichogramma minuta* Riley. This parasite has been reported from eggs of *Aletia argillacea, Odontota suturalis, Plusia brassicae, Heliothis armigera, Papilio glaucus, Vanessa atalanta, Basalarchia archippus* and *Pteronidea ribesi*; the last, of course, a sawfly.

The eggs of the rose sawfly on one hedge of rose bushes, were quite commonly parasitized, counts showing about twenty-five per cent parasitism. Many other sections of the town were examined, but no parasitized eggs found. Each summer since 1919, we have looked carefully for parasitized eggs on the hedge where they had been found and elsewhere, but so far, have not taken any parasites.

The parasitic wasps emerged from parasitized eggs brought in from the bushes, in from one to six days. From one to three wasps issued from each egg. On several occasions I witnessed the emergence by means of the binocular microscope. From one egg, three came forth, one following the other in quick succession. The tiny

wasp cuts its way from the egg shell with its mandibles. The time required for the process in one case was thirty-five minutes from the time the first puncture of the egg shell occurred until the wasp emerged. Where there are more than one wasp in the egg, the second wasp sometimes enlarges the exit hole before attempting to pass. As soon as the wasp comes forth and while the wings are still pads, it can jump an inch with alacrity. The wings fill out in about four minutes. The parasitized egg first turns brown, then shining black. The parasite emerges through a ragged circular hole about one-fourth the diameter of the egg blister while the slug in hatching comes through by making a large crescentic rent in the shell. It is thus possible to include the abandoned eggs in the counts for parasites.

H. B. HUNGERFORD,
University of Kansas, Lawrence, Kansas

Rice Weevil. It has been known that the rice weevil, *Sitophilus oryza*, can cut holes through shuck coverings of corn. These holes, however, appeared to be made chiefly in storage. During early December 1922, the writer observed weevils in the field cutting their way out through a relatively tight fitting shuck covering. A slight opening at the tip of the ear had permitted the entry of a weevil which had penetrated to the base of the ear where it had evidently deposited numerous eggs. The second generation of adults upon emerging from the kernels found themselves confronted with a closely applied shuck covering through which they proceeded to cut their way to the outside. Upon reaching the more loosely fitting outer leaves of the shuck, certain of the weevils crawled unobstructed to the tip of the ear and thus gained freedom, but others much closer to the base were forced to cut their way through each layer of the shuck covering before leaving the ear.

S. E. MCCLENDON,
Field Assistant in Insect Control, Bureau of Entomology, U. S. Dept. Agr.

Rhagoletis tabellaria Fitch. What appears to be a new record for this insect is the finding of the larvae in the fruit of the Western Tall Blueberry in western Washington. On August 15, 1918, while making a trip by automobile from Aberdeen to Markham, Wash., the writer found some tall-growing blueberries in the woods a little way from the narrow road near Markham. The plants here were rather few in numbers and scattered, and were rather sparsely set with berries. On examination these berries proved to be heavily infested with maggots said by the people in that locality to be quite common in blueberries. Some were collected and subsequently placed on slightly moist sand in an insectary. These larvae pupated on August 20, 1918, and adults emerged during the summer of 1919. These have been determined by Dr. J. M. Aldrich of the U. S. National Museum as *Rhagoletis tabellaria*, which was originally described by Fitch in 1855 from specimens collected in New York.

H. K. PLANE

JOURNAL OF ECONOMIC ENTOMOLOGY

OFFICIAL ORGAN AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

FEBRUARY, 1923

The editors will thankfully receive news matter and other items likely to be of interest to our readers. Papers will be published as far as possible in the order of reception, except that papers of reasonable length may be accepted in the discretion of the editor for early publication, at $3.00 per page for all matter in excess of six printed pages; in the case of other matter, the maximum of 2,500 words is still operative. Photo-engravings may be obtained by authors at cost.

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Attention is called to some changes in reprint rates, see the usual paragraphs printed above.

The abstracts appearing in this issue were prepared by the editor and have the approval of the various authors. This method was adopted simply that we might start on a general plan designed to make all biological literature more accessible. Authors are urged to prepare abstracts for future articles, it may be required later, even if the papers are in the editor's hands at the present time. The abstract might well include or take the place of the summary and should be so written as to give a comprehensive and accurate idea of the contents of the paper. Prepare it in such a way that abstract journals can do no better than reprint it, and the indexer have no difficulty in locating the important topics or subjects. Employ concise though complete sentences and distinguish clearly between compilations or digests and contributions to knowledge. Do not overlook methods whenever they are of importance. Get all this within approximately five percent of the length of the paper. The editor welcomes criticisms or suggestions in relation to this departure. He regrets that it may be impossible to please all.

One of the items of business at the recent meeting of the Association was the reading of an invitation to an "International Conference of Phytopathology and Economic Entomology" to be held at Wageningen, Holland, next June (25th to 30th).

It is good that such a conference has been called; and Wageningen will be an excellent meeting place, since it has been the headquarters of

the Holland Phytopathological Service for many years, under the leadership of Dr. Ritzema Bos. International team work and cooperation between the economic entomologists and the phytopathologists is becoming almost daily more important, and this fact is strongly realized in the United States, as is indicated by the extremely interesting symposia that have been held now for three years in succession by the American Association of Economic Entomologists and the American Phytopathological Society; and it is greatly to be hoped that American entomologists and phytopathologists will be present at the coming conference.

A notable fact connected with this announcement is that in its title phytopathology and economic entomology are coördinately mentioned. This, we think, is the first time that this has happened in the recent development of agricultural science in Europe. And it is a good step. The agricultural entomologists of several European countries have not thoroughly approved of the fact that they were considered as belonging to a subordinate branch of a phytopathological service, and have felt that their organizations should be explicitly designated as intended for the investigation of problems relating to phytopathology *and* economic entomology (or the reverse). In America, the economic entomologists have their own independent official organizations and their own independent societies, and Europe will undoubtedly come eventually to the same arrangement. This conference is notable, therefore, as the first step in this direction. It is interesting to note that in the founding of the Société de Pathologie Vegetale de France the economic entomologists joined in for the reason that they were not sufficiently numerous in that country to start their own organization and have since been outvoted as to its title by the more numerous botanists. The whole subject has received a vigorous discussion in Germany, where the economic entomologists founded their own organization after the return of Escherich from America, three years before the World War.

Reviews

Entomology with Special Reference to its Ecological Aspects by J. W. Folsom. Third edition with five plates and 308 text figures, pp. I-VII, 1-502. P. Blakiston's Son and Co., 1922.

The third edition of this standard work bears evidence of thorough revision, including a great deal of new material and a few new illustrations and like its predecessor has been reset. The chapter on "Classification" reflects the latest develop-

ments along this line and the same is true in other portions of the work. The most important change is the addition of a comprehensive and very suggestive chapter on "Insect Ecology," a phase of biology of fundamental importance to economic entomologists. Some 250 new titles have been added to the bibliography, some of the less important in the earlier editions being discarded.

We have in this volume, as in the preceding editions, a most admirable summary of the fundamentals of insect biology and ecology with special reference to its ecological, really economic applications. In effect it constitutes a ready reference work and index to the vast literature summarized in this work. It is an invaluable supplement to our somewhat numerous taxonomic volumes and stands in a class by itself. Doctor Folsom has rendered an invaluable service in bringing his work down to date and we do not hesitate to commend most highly this latest edition to entomologists, especially economic entomologists who should be primarily concerned with biological relations and their practical applications. The price of this work is $4.00.

E. P. F.

Om Oksebremsens Bekaempelse (Fight against the Ox Warble) by Dr. LAUST BRODERSEN. Maanedsskrift for Dyrlaeger (Copenhagen), Vol. 34, Pt.13 Oct.,1922.

The facility with which the ox warbles (*Hypoderma* spp.) can be greatly reduced in numbers is mentioned by the author. The situation of Denmark is favorable to entire eradication of this pest in that country provided a concerted fight should be made against it. The Minister of Agriculture proposed a law last winter looking toward the eradication of the pest throughout the country. While this proposal was received favorably by the lawmaking body it was deemed desirable not to press its passage at that session owing to the danger of the spread of foot and mouth disease by those carrying on the work.

After discussing the various methods of destroying the ox warble and pointing out their difficulties and objections, the author stresses the advantages of an instrument for mechanically removing the larvae or grubs, which he and an engineer of Copenhagen have perfected.

The instrument consists of a brass pump about the size of a small garden hand sprayer. This is arranged with piston and valves calculated to create a partial vacuum. The lower end of the pump is provided with a suction bell of rubber which is applied to the animal over the warble hole. As this is firmly pressed against the warble the handle of the pump is pulled out and the combined pressure and suction removes the larva as well as the pus which surrounds it. He states that in some instances the larvae come out with a single stroke of the pump while in other cases several strokes are necessary.

Before beginning extraction the hide on the back of the animal is rubbed with soapy water to facilitate extraction.

The author states that he has tested this device in extracting about two hundred and twenty larvae from thirty-five animals in different localities. Most of those extracted were in the later stages of development but the author believes that the younger ones could be removed in the same way.

The writer of this review is of the opinion that Dr. Brodersen has made a notable contribution to this field of work in devising this mechanical warble extractor.

It is, of course, desirable that the instrument be tried out on a very large scale, especially with different breeds of cattle, some of which are known to have characters of hide which make grub extraction very difficult. If the instrument works successfully under all conditions it would commend itself on account of the greater cleanliness of the work, lessening the chances of bruising the tissue and possibly producing less pain to the animal, as well as its ability to remove the pus from the cysts.

F. C. BISHOPP,
United States Bureau of Entomology

Current Notes

Dr. A. L. Quaintance of the Bureau of Entomology accompanied Secretary Wallace to the Cotton States Conference, held at Memphis, Tenn., December 5, 1922.

Professor William M. Wheeler gave the annual public address of the Entomological Society of America, December 27, at Boston, on "The Physiognomy of Insects.'

Mr. C. A. Weigel of the Bureau of Entomology gave an address on greenhouse insects before the meeting of the Philadelphia Florists' Club, on November 7.

Professor H. A. Gossard read a paper before the National Nut Growers' Association, Thomasville, Ga., October 4, 1922, on "The Pathway of Progress for the Pecan Grower."

Dr. Henry Skinner was elected vice president and Mr. James G. A. Rehn recording secretary of the Philadelphia Academy of Natural Sciences at the annual meeting, December 19, 1922.

Mr. G. F. Moznette of the Bureau of Entomology was scheduled to give an address at the State Conference on mosquito eradication held at Daytona, Fla., December 6, 1922.

Mr. A. J. Ackerman of the Bureau of Entomology, with headquarters at Bentonville, Ark., planned to attend the annual meeting of the Missouri State Horticultural Society at Joplin, December 13-15.

Professor R. N. Lobdell, associate professor of zoology and entomology and assistant entomologist at the Mississippi College and Station, has been assigned to full-time work on the Station staff as zoologist.

Mr. C. P. Lounsbury, Entomologist of the Union of South Africa, who has been in official entomological work at Cape Town for twenty-six years, has been visiting for several months in the United States.

Dr. Seymour Hadwen returned to Ottawa the latter part of November, after spending several months in Europe, where he studied particularly the Reindeer situation in Lapland, for the United States Department of Agriculture.

Dr. L. O. Howard, Chief of the Bureau of Entomology, and Professor C. T. Brues, Assistant Professor of Economic Entomology at Bussey Institution, gave addresses at the Symposium before Section N (Medical Sciences) at the Boston meeting.

Mr. W. L. McAtee of the U. S. Biological Survey, was scheduled to give a lecture on the work of the Biological Survey at the University of Indiana during his annual vacation which began on October 30.

Mr. G. A. Runner of the Bureau of Entomology, stationed at Sandusky, Ohio, attended the meeting of the Michigan Horticultural Society, the middle of December, and presented a paper on the grape berry moth and its control.

Mr. O. I. Snapp of the Bureau of Entomology with headquarters at Fort Valley, Ga., attended the annual meeting of the Mississippi State Plant Board, held at Agricultural College, Miss., and discussed peach insects and their control.

On December 4, Dr. L. O. Howard, Chief of the Bureau of Entomology, gave a lecture at the school of hygiene and preventive medicine of Johns Hopkins University on the subject of "Medical Entomology and Public Health."

Mr. R. C. Twinn was appointed Junior Entomologist, Entomological Branch, Canadian Department of Agriculture, and reported for duty at headquarters early in October. Mr. Twinn will devote the greater portion of his time to the establishment of the Crop Pest Record.

Dr. L. B. Uichanco, who has been on a traveling fellowship for three years, during which time he has studied at Bussey Institution, Harvard University, has been appointed Professor of Entomology, College of Agriculture, Los Banos, P. I., and has returned to the Philippine Islands.

Some scouting work for the gipsy moth was carried on in certain sections of Ontario and the eastern townships of Quebec. Inspectors Finnamore and Fowler were engaged on this work, and were assisted in Ontario by provincial officers. Fortunately no sign of the gipsy moth was found.

Mr. Dexter H. Craig, field assistant in insect control, attached to the corn-borer investigations, Bureau of Entomology, resigned from the service, effective September 11, for the purpose of entering a commercial school. Mr. Craig expects eventually to enter a large manufacturing concern in an executive capacity.

Dr. B. A. Porter of the Bureau of Entomology, Mr. G. E. Saunders, Manager of the Deloro Chemical Company, Deloro, Ontario, Canada, and Messrs. P. Garman, M. P. Zappe and W. E. Britton of the Connecticut Agricultural Experiment Station are entomologists who gave addresses before the Connecticut Pomological Society at Hartford, Conn., December 13.

Mr. G. H. Hammond, Entomological Branch, Canadian Department of Agriculture who has been serving in a seasonal capacity in Ottawa during the past summer, has been granted the Memorial Scholarship given by the Macdonald College Agricultural Alumni Association for 1922–23. He terminated his appointment with the Branch on November 23d.

In a course of lectures on scientific subjects to be given in the Educational Building under the direction of the New York State Museum, Albany, Dr. E. P. Felt is on the program for two lectures as follows: January 26, "Origin and Evolution of the Insects;" March 2, "Insects and Wireless."

A conference was held at Agricultural College, Miss., November 27–29, to consider additional steps to be taken in the eradication of the sweet-potato weevil in

southern Mississippi. This conference was attended by K. L. Cockerham, F. A. Wright, Troy Thompson, and F. R. White, of the Bureau of Entomology, and various State officials.

Professor F. H. Lathrop, associate professor of entomology and assistant entomologist of the Oregon College and Station has been appointed to the Sulphur fellowship of the Crop Protection Institute, which has been placed under the supervision of the New York Agricultural Experiment Station at Geneva. Professor Lathrop entered upon his duties September 1, 1922.

Dr. A. L. Quaintance, in company with Professor J. J. Davis and W. P. Flint and Mr. A. J. Ackerman, recently made an investigation of the San Jose scale situation in orchards in southern Indiana and Illinois. The scale was found to be very abundant and destructive in some orchards and growers are thoroughly alive to the necessity of energetic remedial measures if the orchards are to be saved.

Mr. E. R. Buckell who was recently appointed as an Assistant Entomologist, Entomological Branch, Canadian Department of Agriculture, reported for duty on November 27th, coming direct to Ottawa from British Columbia. He is now engaged in preparing a report on the influences of grasshoppers on the range. He reports that the most serious outbreak of grasshoppers in the history of the Province occurred during the past year.

Very excellent collections of insects have recently been received from the Rev. W. W. Perrett, Labrador; Mr. C. H. Crickmay from the Fort Norman district; and from Mr. J. Russell, of the Topographical Surveys Branch, Department of the Interior, Ottawa, the latter from the Great Slave Lake region. All of these collections contain material which is new to the Canadian National Collection, and will prove most valuable to the student of the arctic fauna.

Mr. C. H. Curran has been appointed Assistant Entomologist, Entomological Branch, Canadian Department of Agriculture, and attached to the Division of Systematic Entomology. He reported for duty in Ottawa on September 28th. Mr. Curran is a specialist in the Diptera, and has been working on Asilidae, Bibionidae and Stratiomyidae. Officers in charge of Canadian laboratories are urgently requested to send in as soon as possible any material they may have in any of the above families.

The European corn borer scouting work was completed in southern Ontario on September 23d. During the season 165 townships were scouted, of which 45 were found infested and later quarantined. The corn borer has spread over Essex, Kent, Lambton and part of Huron Counties, as well as along the Lake Ontario shore as far east as Brighton. Seven evasions of the quarantine were discovered by Inspector Ryan, six of these were prosecuted and five convictions secured.

Mr. James Zetek, in charge of the field station of the Bureau of Entomology at Ancon, Canal Zone, reports that F. X. Williams, an entomologist of the Hawaiian Sugar Planters' Experiment Station, spent a week at the field station. He left for Ecuador, where he hopes to find the parasites of the sugar-cane wireworm. Should he fail there, he intends to return to the Canal Zone and go to the interior of Panama, where favorable facilities for his work have been procured.

Mr. R. T. Cotton, Bureau of Entomology, recently investigated the Angoumois grain moth situation in Salem County, N. J., and in and about Charlottesville, Va. Wheat thrashed late in the season in these localities was very badly damaged. These examinations were a continuation of those made by Dr. Back and Mr. Cotton on the farms of Montgomery County, Md. In Montgomery County late-thrashed wheat was frequently found damaged from 40 to 90 per cent., while wheat thrashed directly after harvest showed less than 1 per cent. infestation.

Mr. L. S. McLaine left Ottawa on September 28th for a trip to the Maritime provinces and Boston, and returned to headquarters on October 16th. During his trip he arranged with the provincial authorities in New Brunswick and Nova Scotia the brown-tail moth work for this coming winter. He also visited nurserymen in Nova Scotia in connection with the apple sucker quarantine, and investigated certain matters relating to the fumigation and inspection work carried on in New Brunswick and Nova Scotia. During his visit to Boston, he interviewed the officials connected with the European corn borer and gipsy moth work.

Messrs. C. H. Popenoe, J. E. Dudley, Jr., R. E. Campbell, and J. E. Graf of the Bureau of Entomology attended the pea aphis conference in Chicago at the Sherman Hotel, November 9 and 10, for the purpose of arranging cooperative work on the insect in the interest of State Entomologists. The conference was largely attended by State Entomologists and representatives of canners. As a result of the meeting, recommendations governing future work on this insect were drawn up and endorsed by both entomologists and canners. Present plans contemplate establishing a large laboratory in one of the central states and cooperative tests with various State Entomologists in all important pea-growing sections.

The annual meeting of the Crop Protection Institute was held at Rochester, N. Y., January 11 Professors W. C. O'Kane, P. J. Parrott and W. E. Britton of the Board of Governors were present, and Professor O'Kane was elected Chairman for the coming year. At the dinner following the meeting, Professors W. C. O'Kane, P. J. Parrott, Lawson Caesar and Mr. H. L. Frost were speakers. Other entomologists present were Hugh Glasgow, and Dr. M. D. Leonard. The New York Horticultural Society held its annual meeting at the same time at Rochester and in addition to the entomologists mentioned above, Dr. E. P. Felt and Professors G. W. Herrick, C. R. Crosby and H. E. Hodgkiss were among those in attendance.

According to the October News Letter of the Bureau of Entomology, the Bureau now has 75 field stations, 71 of which are located in 33 states. Texas has eight, California and Florida six each, Louisiana, Mississippi and Oregon four each, Massachusetts has three and Alabama, Arizona, Georgia, New Jersey, New York, North Carolina, Pennsylvania, Tennessee, Virginia and Washington two each. Arkansas, Colorado, Connecticut, Idaho, Illinois, Indiana, Iowa, Kansas, Maryland, Missouri, Montana, Ohio, South Carolina, Utah, West Virginia and Wisconsin have one each, and there is one in the Canal Zone, one in France, one in Japan, and one in Hawaii.

Mr. C. H. Popenoe, Bureau of Entomology, returned from an inspection trip in the Estancia Valley in New Mexico where he conducted observations and made preliminary plans for work on the Mexican bean beetle. Arrangements were made for overwintering the beetles in outdoor cages under varying mountain conditions and for securing data the coming season on winter mortality and dispersal of marked

beetles from hibernation cages. Mr. Popenoe found that because of the extreme drought in that region the insect had not gone into hibernation as early as in previous years, and had become concentrated in localities not previously seriously infested. Because of the ravages of the beetles and of the improbability of securing a crop, the bean growers have been instructed to pasture off all bean lands containing growing plants, thereby reducing the number of the beetles successfully hibernating and, consequently, the next year's infestation.

The meetings of the Entomological Society of Ontario were held in Guelph on Friday and Saturday, November 24–25. The following members of the staff of the Entomological Branch, Canadian Department of Agriculture, attended the meetings: Messrs. Gibson, McLaine, Treherne, Ross, Crawford, Hudson, and Hutchings. The papers presented by officers of the Branch were: "Recent Developments in the Dominion Entomological Service," Arthur Gibson; "The Spread of the European Corn Borer in 1922," L. S. McLaine; "Ploughing as a Factor in Controlling the European Corn Borer," H. G. Crawford; "Mechanical Devices used in Control of the Strawberry Root Weevil," W. Downes; "Observations on the Oviposition of *Senotania trilineata*," C. H. Curran; "The Relationship of Biological and Taxonomic Studies of Syrphidae," C. H. Curran; "Notes on *Frankliniel'a tritici* Fitch," R. C. Treherne; "Biologic Notes on two Buprestid Beetles," C. B. Hutchings; "The Outbreak of the Grape Leaf-Hopper," W. A. Ross and W. Robinson; "Some Observations on the Oviposition of *Hypera punctata*," H. F. Hudson; "Recent Work on the Rose Chafer." W. A. Ross and J. A. Hall, and "The Occurrence of the Potato Seed Maggot in Ontario," G. H. Hammond.

The seventeenth annual meeting of the Entomological Society of America was held in Boston, Mass., in the Buildings of the Massachusetts Institute of Technology, on December 26, 27 and 29, 1922. The meetings were unusually well attended, the attendance ranging from about 75 to 250 in the different sessions. Seventy-four new members were elected during the past year, bringing the total membership to 652, the largest in the history of the Society. The following officers were elected: President, Prof. T. D. A. Cockerall, University of Colorado, Boulder, Colo.; First Vice-President, Dr. Wm. S. Marshall, University of Wisconsin, Madison, Wis.; Second Vice-President, Dr. F. E. Lutz, American Museum of Natural History, New York City; Secretary-Treasurer, Dr. C. L. Metcalf, University of Illinois, Urbana, Ill.; Managing Editor of Annals, Prof. Herbert Osborn, Ohio State University, Columbus, Ohio; Additional members of Executive Committee: Arthur Gibson, Dominion Entomologist, Ottawa, Canada; Dr. Wm. A. Riley, University of Minnesota, St. Paul, Minn.; Prof. R. A. Cooley, Agricultural Experiment Station, Bozeman, Mont.; Mr. Charles W. Johnson, Boston Society of Natural History, Boston, Mass.; Dr. E. P. Felt, State Entomologist, Albany, N. Y.; Prof. A. L. Melander, State College, Pullman, Washington. The Society voted to raise the annual dues from $2.00 to $3.00, effective January 1, 1924. Professor J. J. Davis of Purdue University was appointed Treasurer of the Thomas Say Foundation, to succeed Dr. E. D. Ball, resigned. Messrs. R. A. Cooley, R. W. Harned, and Guy C. Crampton were elected as new members of the Editorial Board of the Annals. The Society approved the constitution for the Union of American Biological Societies, as published in *Science* for September 29, 1922, and appointed A. N. Caudell and A. G. Boving as the representatives of the Society to attend such meetings as may

be called in Washington during the coming year. The following subject was selected for the Symposium at the Cincinnati meeting in 1923: "Methods of Protection and Defense Among Insects."

Horticultural Inspection Notes

Messrs. G. S. Langford and P. D. Sanders have been appointed to fellowships in the State Horticultural Department, University of Maryland, and a portion of their time will be devoted to regulatory matters.

Mr. L. R. Dorland, who formerly was in charge of the work of the Federal Horticultural Board at Del Rio, Texas, has exchanged ports with Mr. H. M. Cely, who for the past two years has been in charge of the Board's activities at Nogales, Arizona.

Mr. E. I. Smith, a graduate of the University of West Virginia, was temporarily appointed as Plant Quarantine Inspector to assist in the examination of plants arriving in Washington, D. C., under special permit during the months of December, January and February.

Professor E. N. Cory, State Entomologist of Maryland, reports that as high as ninety-seven per cent. of the foreign bulbs which have been inspected in Maryland during the present shipping season were found to be infested with mites; and in many instances, soft rot was present.

Inasmuch as plants bearing invalid certificates continue to arrive in the District of Columbia, it would appear that various state officials charged with the inspection of nurseries should take steps to prevent the further use of certificates of this type. A certificate dated "1912" was taken from a shipment arriving in Washington this season.

Mr. A. C. Fleury, Quarantine Officer in Charge at San Francisco, California, reports that oranges purchased in Japan, found in passenger's baggage arriving at that port ex. S. S. President Wilson in December were infected with Citrus Canker. Interceptions of this kind forcibly emphasize the need of careful examination of passenger's baggage, in cooperation with Customs officials, at ports of entry.

In a recent letter, Mr. A. C. Brown reported the following interceptions by inspectors of the State Plant Board of Florida: *Aleurocanthus woglumi* Ashby on spice leaves from Nassau, Bahama Islands; *Targionia hartii* Ckll. on yams from Havana, Cuba and Barbados, British West Indies; *Aspidiotus destructor* Sign. on palm from Trinidad, British West Indies, and Sugar Apple from Cardenas, Cuba; and *Anastrepha fraterculus* (Wied.) on Guavas from Havana, Cuba, arriving at Key West, Florida.

A committee composed of two representatives from the American Phytopathological Society, and one from each of the following organizations—the American Association of Nurserymen, the American Society of Horticultural Science, and the Section on Horticultural Inspection—is being appointed for the purpose of making a thorough study of Crown Gall in its various phases, and also to arrange a program for a joint session of the organizations mentioned above at the Cincinnati meetings. The full personnel of this committee has not been appointed; however, Mr. H. F. Dietz, Assistant Entomologist, of Indiana, has been designated to represent the Section on Horticultural Inspection.

The Public Hearing to consider the advisability of restricting or prohibiting the importation of fruits and vegetables in the raw or unmanufactured state from all foreign countries and localities on account of the Mediterranean and other fruit flies, held by the Federal Horticultural Board December 19, 1922, was well attended. The California State Department of Agriculture was represented by Mr. Lee A. Strong, and the State Plant Board of Florida by Dr. J. H. Montgomery. Both of these men took part in the discussion. Other out of town entomologists attending the hearing were Messrs. Glen W. Herrick (Cornell University), A. W. Morrill (California), and C. P. Lounsbury (Union of South Africa).

Notes on Medical Entomology

The New Jersey 1922 legislature appropriated $18,000.00 for mosquito control.

Mr. A. Robertson of the Treesbank laboratory, Canada, has now collected twenty-two species of mosquitoes in a special study he is making and many notes have been obtained of their breeding habits.

According to *Science*, Professor W. A. Riley, chief of the division of entomology, University of Minnesota, returned in September from a three month's stay in Porto Rico, where he made an intensive study of the relation of the soil conditions to the propagation of parasites.

On November 10 a mosquito conference was called at Houston by the Texas Chamber of Commerce for the purpose of formulating plans to reduce the economic waste and annoyance from mosquitoes in the Southwestern States. Considerably over one hundred health officers, sanitarians, drainage engineers etc., were in attendance. Following a brief address by Mr. J. S. Cullinan, President of the Texas Chamber of Commerce, the life history and habits of mosquitoes, especially Anopheles and *Aedes aegypti*, were discussed and demonstrated by Dr. A. C. Chandler of Rice Institute, in the absence of F. C. Bishopp who was unable to be present. Dr. J. A. LePrince of the United States Public Health Service discussed mosquito control and losses chargeable to these insects. Mr. V. M. Ehlers, chief sanitary engineer of the State Board of Health, discussed practical methods of controlling msoquitoes. Resolutions looking toward the formation of organizations in various parts of the Southwest to further mosquito control work were adopted. Dr. Oscar Dowling, State Health Officer of Louisiana, Dr. C. W. Garrison, State Health Officer of Arkansas, and Dr. J. H. Florence, State Health Officer of Texas, were in attendance and took part in the discussions. Dr. W. T. Davidson, Director of Public Health of Dallas, presided.

Notes on Apiculture

The Indiana State Beekeepers Association held a meeting at the State House, Indianapolis, December 21 and 22.

The seventh annual winter meeting of the North Carolina State Beekeepers Association was held at Charlotte, January 11.

The fall convention of the Connecticut Beekeepers Association was held at the State Capitol, Hartford, October 28.

The Northern Virginia Beekeepers' Association has just recently been organized. Clinton H. Shockey, Vienna, Va., is the Secretary.

The Wisconsin State Beekeepers' Association has planned to hold its annual convention at Milwaukee, December 14 and 15.

The University of Wisconsin announced a short course in beekeeping to be held at Madison, November 13 to December 20.

The annual meeting of the Northern Illinois and Southern Wisconsin Beekeepers' Associations was scheduled to be held at Freeport, Ill., October 17.

Dr. S. B. Fracker, State Entomologist of Wisconsin, has accepted the secretaryship of the American Honey Producer's League for the remainder of the year.

November 17 and 18 were the dates set for the meeting of the Oregon State Beekeepers' Association, Professor H. B. Scullen, Corvallis, Ore., Secretary.

The annual meeting of the Michigan Beekeepers Association was held at the Michigan Agricultural College, East Lansing, January 30 and 31.

The annual meeting of the Maryland Beekeepers Association was held at Frederick, January 10. Dr. E. F. Phillips and Professor E. N. Cory were among the speakers.

The annual meeting of the New Jersey Beekeepers Association was held at Trenton, January 18 and 19. Among the speakers were George H. Rea and Dr. E. F. Phillips.

The Empire State Federation of Beekeepers' Co-operative Association, Inc., will hold its annual meeting at Syracuse University, Syracuse, N. Y., December 5-7. O. W. Bedell, Earlville, N. Y., is Secretary.

The Iowa State Beekeepers' Association planned a mid-west beekeepers meeting at Council Bluffs, Iowa, on November 14 in conjunction with the mid-west Horticultural Exposition which ran through the week.

The annual meeting of the Chicago Northwestern Beekeepers' Association was set for December 4 and 5 at the Great Northern Hotel, Chicago, Ill. J. Frank Haan, Des Plaines, Ill., is Secretary-Treasurer.

According to *Gleanings in Bee Culture*, Mr. George H. Rea has resigned his position as extension specialist at State College, Pa., to accept a position with the A. I. Root Co., as service representative.

Messrs. Bruce Lineburg, A. D. Shaftesbury and B. Kurrelmeyer, who have been working temporarily in the bee culture laboratory of the Bureau of Entomology, have returned to continue their studies at Johns Hopkins University.

Purdue University, Lafayette, Ind., has announced a beekeepers short course and conference January 29—February 1. Dr. E. F. Phillips, George S. Demuth and Professor H. F. Wilson were expected to be present and make addresses.

The annual meeting of the Illinois State Beekeepers' Association was set for December 6 and 7, at the St. Nicholas Hotel, Springfield, Ill. Speakers expected were E. R. Root, C. P. Dadant, George E. King, and Allen Latham of Norwichtown, Conn.

The New York State College of Agriculture, Ithaca, N. Y., has announced a short course in beekeeping to be held February 20–23. Instructors will be Dr. E. F. Phillips and George S. Demuth, assisted by George H. Rea, E. W. Atkins and R. B. Willson.

Recent visitors at the Bee Culture Laboratory, Bureau of Entomology, were Dr. S. O. Mast, Johns Hopkins University; H. F. Wilson, University of Wisconsin; George H. Rea, Pennsylvania State College; and Kenneth Hawkins, formerly an agent of the office, now with the G. B. Lewis Company, Watertown, Wis.

Mr. George W. York, Spokane, Washington, who for 20 years was editor of the *American Bee Journal*, has donated his entire collection of bee books and other beekeeping literature representing an accumulation of 40 years, to the University of California. The University in accepting this valuable gift has decided to establish the George W. York Library of Apiculture of California.

Pacific Slope Notes

Mr. G. A. Coleman, instructor in entomology at the University Farm, Davis, California, has resigned.

Mr. A. J. Flebut of the Bureau of Entomology attended the 55th annual convention of farmers and fruit growers at Sacramento, California, the middle of December.

The Entomological Field Station of the Idaho Agricultural Experiment Station has been moved from Twin Falls and Rexburg to Parma where experimental work will be conducted for a period of several years.

Mr. Harold E. Woodworth, Assistant Professor of Entomology at the University of the Philippines is visiting his home in Berkeley on a brief leave of absence. He has been in the Philippines for three years associated with Professor C. F. Baker at Los Banos.

Messrs. W. D. Whitcomb and E. J. Newcomer of the Bureau of Entomology were scheduled to attend the annual meeting of the Washington Horticultural Association at Spokane, December 12–15. Mr. Newcomer was to discuss the control of the San Jose scale by the engine-oil emulsion.

Prof. C. W. Woodworth who is in charge of the entomological work in the Kiangsu Province with headquarters in the National Southeastern University at Nanking, sailed from Hong Kong on December 25 on a trip to Japan, India, Palestine and Europe, where he expects to spend some time at the entomological museums. He will return to China by New York and San Francisco, expecting to arrive in New York on April 14.

Dr. Edwin C. Van Dyke sailed for China on January 2, to spend his sabbatical year of 1923 in China and Japan. His headquarters will be the College of Agriculture, National Southeastern University, Nanking, China, and he will carry on some of the entomological work started by Professor C. W. Woodworth. Besides his instructional work, he hopes to make a general survey of entomological conditions in China, Corea and Japan insofar as his time will permit.

GIPSY MOTH AND EUROPEAN CORN BORER CONFERENCE

A conference at Albany November 16 to consider recent developments in the gipsy moth and European corn borer situations was called by Commissioner B. A. Pyrke of the Department of Farms and Markets of the State of New York, and invitations were sent to officials in all of the New England States, New Jersey, Pennsylvania, Ohio and New York, the U. S. Bureau of Entomology and the Dominion of Canada. Entomologists present were Doctors E. D. Ball, Director of Scientific Work, U. S. Department of Agriculture, L. O. Howard, C. L. Marlatt, Messrs. W. R. Walton, A. F. Burgess, D. J. Caffrey, L. H. Worthley and H. L. McIntyre of the U. S. Bureau of Entomology, Mr. L. S. McLaine and Dr. J. M. Swaine, Entomological Branch, Canadian Department of Agriculture, Dr. T. J. Headlee, State Entomologist, New Brunswick, N. J., Mr. W. A. Osgood, Assistant Entomologist, Durham, N. H., Dr. W. E. Britton, State Entomologist, New Haven, Conn., Professor P. J. Parrott, Entomologist, Agr. Expt. Sta., Geneva, N. Y., Professor G. W. Herrick, Entomologist Cornell Agr. Expt. Sta., Ithaca, N. Y., Dr. E. P. Felt, State Entomologist and Mr. D. B. Young, Assistant, Albany, N. Y., Dr. George G. Atwood, Director Bureau of Plant Industry, and Mr. B. D. Van Buren, Albany, N. Y. Dr. A. W. Gilbert, Commissioner of Agriculture, and Messrs. R. H. Allen, George A. Smith and C. O. Bailey, Boston, represented Massachusetts, Mr. Harold L. Bailey, Assistant Commissioner of Agriculture, Bradford, represented Vermont, and Mr. Sheals represented Rhode Island. Conservation Commissioner C. R. Pettis, and Agricultural Commissioner B. A. Pyrke were also present, the latter acting as Chairman.

The chief speakers on the gipsy moth were Dr. E. P. Felt and Mr. A. F. Burgess, followed by Messrs. Atwood, Smith, C. O. Bailey, H. L. Bailey, Osgood, Britton, Sheals, Headlee, McLaine, Pettis, Marlatt, Howard and Ball. Resolutions were formulated and duly adopted. The proceedings have been published by the New State Department of Farms and Markets as Bulletin 148.

In the afternoon the European corn borer was discussed, the principal speakers being Mr. W. R. Walton and D. J. Caffrey of the U. S. Bureau of Entomology, followed by Dr. A. W. Gilbert, L. S. McLaine, Drs. L. O. Howard, C. L. Marlatt and E. D. Ball. Resolutions were also adopted, asking that the present control measures be continued.

Dr. E. F. Phillips lectured before the Brooklyn Institute of Arts and Sciences on Janurary 13 on "Bees and Beekeeping."

The annual meeting of the Maryland State Beekeepers' Association was held in conjunction with the Farmers' Conference at Frederick, Maryland, on January 10. The principal speakers were E. F. Phillips of the Bureau of Entomology and A. D. Shaftesbury of Johns Hopkins University.

Contributions of books and journals for the Miller Memorial Beekeeping Library are being received from all parts of the world and the library already contains several very rare and valuable books. It is planned to dedicate the library some time during next August.

E. P. Felt will give a lecture on:—"Engineering and Insect Control," from the broadcasting Station of the Rensselaer Polytechnic Institute, Troy, New York, "WHAZ," wave length 360 meters between 8:15 and 9:30 P. M., Monday night, February 19th.